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Electrical World

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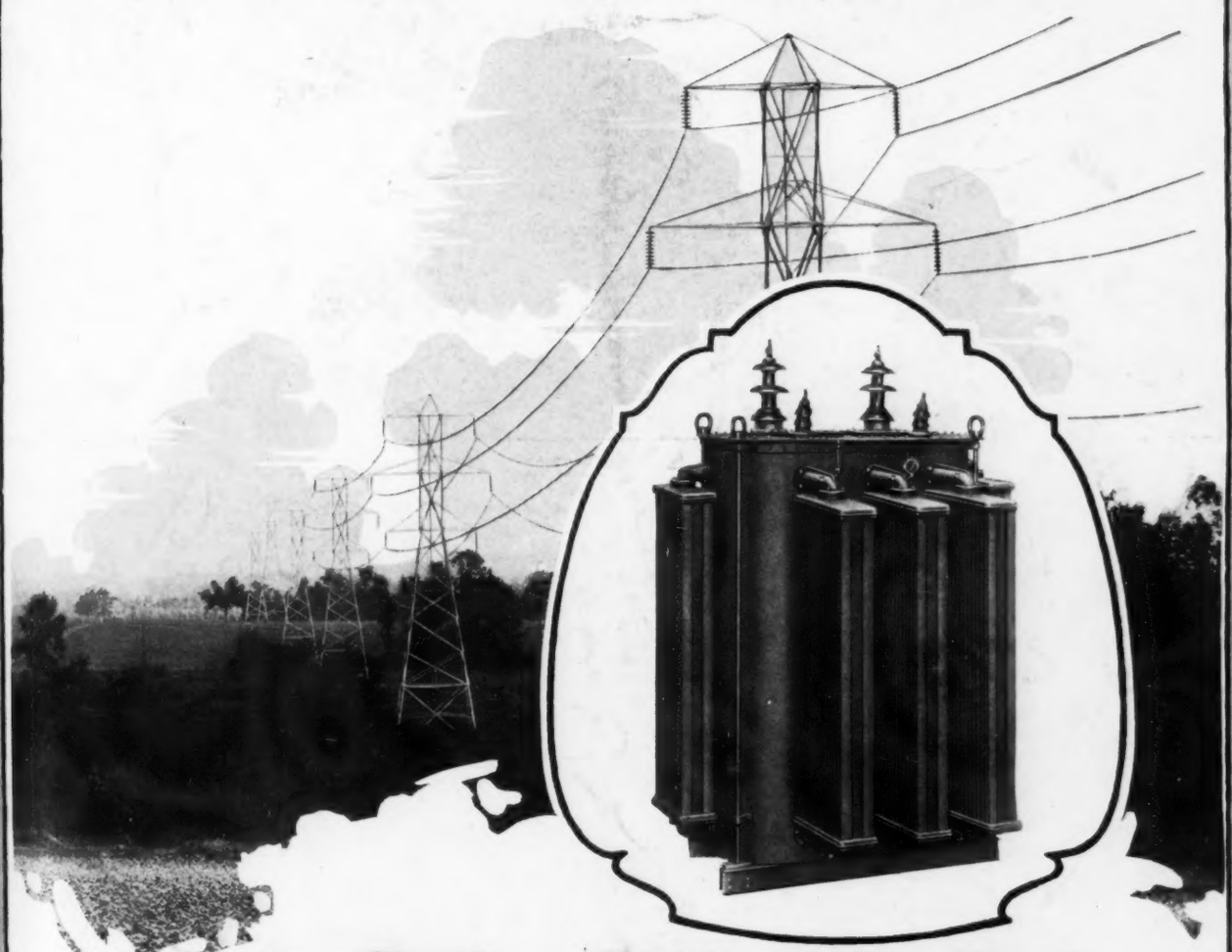
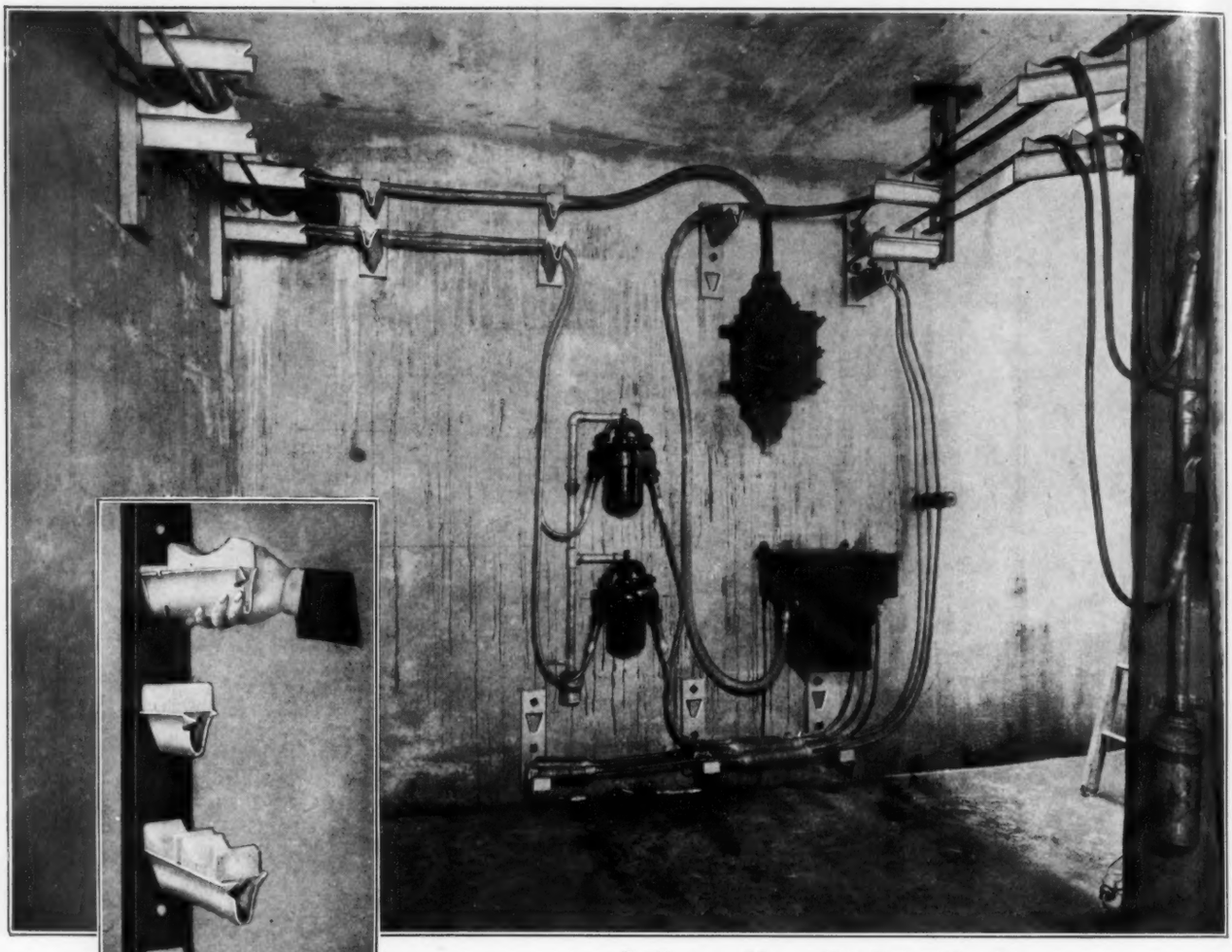
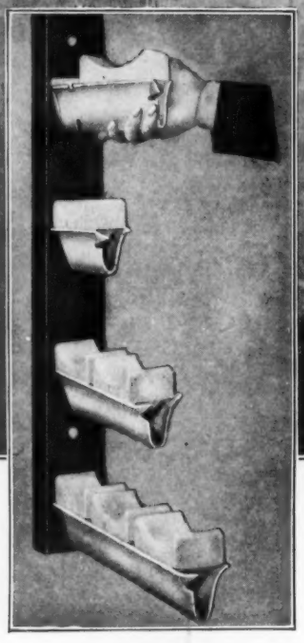
By past performance Moloney transformers have earned their present nation-wide approval



MOLONEY
TRANSFORMERS
Moloney Electric Company, St. Louis, Mo.





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Booklet Shows Other Interesting Installations

METROPOLITAN DEVICE CORPORATION

MANUFACTURERS OF MURRAY PROTECTIVE DEVICES

1250 Atlantic Ave., Brooklyn, N. Y.

Electrical World

Published by McGraw-Hill Publishing Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 87 — *New York, Saturday, April 17, 1926* — NUMBER 16

International Electrotechnical Commission Meets Here

A DISTINGUISHED group of engineers and scientists have gathered in this country to attend the meeting of the International Electrotechnical Commission. This is the first time that this famous conference has been held in this country, and the United States National Committee has made all possible preparations to make the meeting profitable and entertaining. Official delegates from fifteen countries will meet and discuss many major subjects dealing with international engineering and standardization topics. Our country is particularly interested in these meetings because they tend to improve engineering and commercial conditions.

Perhaps the international viewpoint on symbols, ratings and nomenclature may help to clarify our own national viewpoint and speed up our own standardization work. It is decidedly important, from the standpoint of foreign trade, to get international agreement on ratings. Finally, it is of the utmost importance that all engineers and scientists be aware of progress in the art as it is achieved and be able to discuss science and engineering in terms of a common system of nomenclature and symbols.

Beyond the strictly technical features of the program there is afforded an opportunity for the friendly social mingling of the engineering pioneers of the world. It is to be hoped that the friendships and contacts thus formed will make for faster progress and greater forbearance in the treatment of all international questions. All American groups welcome the visitors and hope they will have a pleasant and profitable visit.

Electricity and Labor

THE high standard of living of the American people, and especially of American labor, being not unknown to the British government, and that government suffering more or less harassment from labor, the Prime Minister in a speech at Birmingham expressed the fervent desire that British labor might study conditions in America to its profit and the empire's good. Accordingly the London *Mail* sent to this country a number of leaders chosen by labor itself to study conditions and ascertain just why the American workingman fares so extraordinarily well. The delegates sailed for home last week after visiting Chicago, Detroit, Cleveland, Cincinnati and numerous cities on the Atlantic seaboard. What they will report will not be made public until after they reach England. Seeing is believing, and, without seeking for any eulogies from our British cousins, we of America will hope that, profiting from our experience, England and British industry may again take heart. After all, prosperity is largely a matter of sentiment and belief. As a man thinketh so is he, and if capital and labor will co-operate in England as they have in this country, only good can follow.

From such fragmentary comments as some of the delegates have made on their trip of inspection, it is evident that they were impressed by the great use made of electricity in the arts as the handmaid of industry and in the home as the bearer of burdens and the dispenser of comforts and conveniences. Discovery was also made of the fact that American labor welcomes labor-saving appliances and the unlimited use of power in industry since they enable labor to produce more and thus to earn more. In all of the cities visited the British delegates had opportunities of observing at first hand the multitudinous applications made of electricity and also saw how electricity is produced in modern superpower stations. No one coming from England could help being impressed by such widespread employment of electrical energy, and if, as there is reason to believe, the returning delegates will attest this use and the benefits flowing from it, the hope which Stanley Baldwin has expressed in the saving grace of electricity will be realized. It may take a little more yeast of this sort before the whole lump of British ultra-conservatism becomes entirely leavened, but at this juncture, when the British Parliament is debating the new electricity supply proposals of the Prime Minister, even a little yeast will go a long way in remedying the conditions that have too long held back the proper development and use of electricity in Great Britain.

Engineering Economics to the Rescue

COST data are becoming of supreme importance to the electrical industry. Economic ability on the part of engineers has been demanded all along the line of march from the pioneer days of the central station and the manufacturer down to the present era of truly magnificent development, but the modern investment in electrical service puts a premium on financial insight into technical affairs. Manufacturing of equipment and the generation and efficient transmission and distribution of energy have become enormously complicated as well as amazingly flexible. Decisions on policies carry unprecedented responsibilities along economic lines, and there is a growing need of keen analytical power among engineers of granted technical competence and of trained capacity to allocate costs more effectively than in the past. Something approaching scientific precision is called for in planning and in handling the vital problems of production and distribution in both the technical and commercial phases of the industry's daily work.

Some of these problems of cost determination are so difficult that in many organizations only the surface has been scratched in getting at their roots. Consistent allocations of the cost of different classes of central-station service are scarce; the adequate comparison of rate systems among companies of similar size is hardly in its beginnings, and the establishment of standards of checking generating-plant performance in interconnected systems as affected by regional load conditions, water-power availability and over-all grouped fuel economies is far from perfection, although progress is

being made, and in some groups, indeed, precision control of plants and tie lines is fast being realized. Commercial distribution costs are virgin soil for cultivation. To the engineer with economic leanings—and there are not a few such who would be hard put to make a comfortable living in the designing and construction fields—these and like problems offer a splendid challenge. No one can foresee the time when costs will cease to establish the final test of successful service, using the word in its broadest sense. Upon engineers with special economic qualifications rests the whole future structure of sound development within the utility and allied industries, and it is well that this pressing need is receiving recognition in our graduate schools of engineering and business administration. In executive and technical circles one notes increasing appreciation of the place of economics as applied to current and future problems, and during the next few years we shall see an unprecedented development of the scientific method in the conduct of industry affairs.

Rising Standards of Interconnection

THE deeper one goes into the economics of interconnection, the more one is impressed with the number and variety of problems created by this matchless advance in operating engineering. The past decade has witnessed nothing less than a revolution in power supply methods due to tying plants and systems together in areas formerly served by local stations or by relatively short transmission lines. Many difficult problems have been solved, but many more have arisen to claim the engineer's attention, and some of these questions demand an amount of study comparable to that required in the preparation of a great case at law.

The fundamental theory of interconnection is simple enough to be grasped by the ordinary intelligent layman, and because this is so very little real opposition has been aroused as tie after tie has been projected, developed and put in service. Quite another story is the technical handling of energy interchange, the harmonizing of intersystem contracts with correct metering practice, the forecasting of loads, strategics of weather reports, control of frequency, limitation of the zones of operating trouble, co-ordination of responsibility for maximum reliability and efficiency of system service, relay applications and other matters influential in the successful conduct of power pools.

The technique of interconnection owes a great deal to the men whose daily if not hourly duty it is to order the necessary transfers of energy to load centers. Some very fine work has been done here and notable records have been made in fuel savings and in increased service reliability. Now, however, standards of practice are rising in many localities. More accurate means of determining rapidly when to buy and when to sell energy via the tie-line route are being demanded. New graphs and charts are being sought to enable operating men to get to the heart of the cost problem in the shortest possible time. As multiple "tie-ins" develop, the methods of metering and of billing for blocks of power at various points in more or less complex networks begin to exert heavier pressure upon engineering ability. The importance of first-class records is now economically vital to large areas, and a new type of engineering specialist is coming to the front to cope with intersystem activities. From comparatively simple "tie-ins" with fairly obvious tasks in meeting emergency demands for power, interconnection has today become a profound subject bristling with technical problems and weighted down with economic values challenging the best skill of the electrical expert. Fortunate it is that as the search for more refined methods goes forward the more immediate rewards of interconnection can be obtained on the way toward a thorough professional mastery of this great and growing art.

Some Statistics of French Inventions

JUST as the World War has led in this country to the formation of the National Research Council, so the French government has established a National Office of Researches and Inventions, with a "superior examining commission" at the head of it. It seems as though the French organization pays more attention to actual inventions than to fundamental research. A large laboratory and shops have been built in which meritorious inventions are subjected to trial. From the 1925 report of the commission we gather that during that year it examined 680 new inventions, of which it retained 77 proposals, or 11.3 per cent, as being of interest and referred them to the technical committees for further investigation. Of the proposals 7.3 per cent were found to contain ideas of interest but not realizable or practicable at the present time. The remainder—that is, 553 offers (81.3 per cent)—were judged either to possess no novel features or to be impracticable.

More than 1,200 reports had to be written in connection with this work. In addition, the technical committees were called upon to render expert service on 33 competitions for appliances of various kinds for public service, 58 questions submitted by the industries, four requests for laboratory research and three studies undertaken on the commission's own initiative. Altogether during the year 1925 the organization handled 225 new problems. Such intensive activity is possible only with a definite government budget and a paid personnel. Apparently the French government fully realizes its importance in times both of peace and of war.

Good Lighting, Like Charity, Begins at Home

RECENT researches have proved the economic value of higher intensities of illumination for homes, offices, stores, streets and factories. With the establishment of lighting service departments many electric service companies are now preaching the gospel of better illumination to their customers. However, many commercial managers who observe that the cobbler's children have poor shoes do not take the lesson to themselves. Few buildings occupied by electric service companies are illuminated to the standards which their lighting departments and other developers of lighting are advocating. The best-lighted offices, stores and show windows in the world are not found in these buildings, but for very important and obvious reasons this should be the case.

A new building recently designed and built by a light and power company has its offices illuminated to an intensity of only 7 foot-candles, although the company is recommending more than 10 foot-candles for the offices and factories of its customers. Some buildings not occupied by lighting interests have average illumination

intensities as high as 15 foot-candles and even higher. A very progressive electric service company whose new-business department is doing great work in selling modern standards of lighting has show windows on two streets in the business section in which the equipment is wholly unfit for window lighting.

Everywhere in such buildings opportunities are available for demonstrating in actual use the most modern lighting equipment and the high standards of illumination now known to be desirable. In many cases the failure to profit from these opportunities outdoes the neglectful cobbler of the proverb to which allusion has already been made. By taking their own advice the electric service companies not only profit by good lighting as their customers do, but they demonstrate and advertise the benefits of good lighting without cost to themselves.

The Next World to Conquer

THE development of industrial electric heating is rapidly gathering impetus. As has been repeatedly pointed out in the columns of this magazine, the potential market for electrical energy in this field has been invaded only very slightly; in military parlance, the lines are hardly yet across the frontier.

The point is often made in both written and spoken effusions on the past history and future prospects of the central-station industry that the time is past for business to come to the electricity supply companies without consistent effort on their parts to bring it in. The future preoccupation will be, not supplying capacity for the waiting business, but lassoing business for the waiting capacity. Coincident with the appreciation of this condition comes the opening up of a large field which needs only cultivation to yield a rich harvest. But the cultivation must be done, and those central-station companies that provide themselves with the necessary plows, hoes, rakes and harrows in the shape of sales engineers who know industrial heating will reap first and most bountifully.

As an instance of the growing interest in the subject, profitable notice can be taken of the conference on industrial electric heating recently held by the engineering school of Purdue University. There is a striking significance in the fact that the attendance was representative of the industries of Indiana and of those surrounding Chicago and that one of the principal addresses was delivered by a manufacturer of gears and tools—a user of electrical energy and not a seller of it. This speaker stressed the obligation of makers of automobile parts to put all they could of quality into their products because lives depend on them. Since heat treatments of various kinds are essential steps in such productions, one may readily infer that his remarks on quality of product were inspired by the acknowledged superiority of electricity in heat treating.

Nineteen separate arguments in favor of electric heat, and each a cogent one, were adduced and indorsed at this conference. Some of the users present went so far as to state that because of these advantages they would continue to employ electricity even if the cost of competitive means of heating were eliminated entirely. These arguments—"advantages" is a much better word—are prominently displayed elsewhere in this issue and range from the timeworn, but still alive and powerful, "ease of control" to such special applications as heating in a vacuum.

In regard to comparative costs, it was stated by one speaker that he considered electricity at 2 cents per kilowatt-hour, oil at 6 cents per gallon and gas at 50 cents per 1,000 cubic feet to be equivalent in cost. It was pointed out by a number of others that cost comparisons between oil and electricity very infrequently have taken account of oil-handling charges right up to the furnace door or included the full measure of maintenance and control costs. It was admitted that certain heat processes in which stringently definite requirements as to quality of product were not imposed could be carried on satisfactorily and more cheaply in a combustion type of heating device, but even here, if consideration is given to cleanliness, control, healthful working conditions and other accompanying factors not directly essential to operation, electricity could demonstrate superiority.

In developing industrial heating business the central-station industry needs only competent power salesmen who approach the business with a knowledge of the subject and study it from the viewpoint of the user and not the seller. The power business of the industry was built by approaching it from the viewpoint of the industrial user, and the same principle should be applied to the industrial heating business.

Practical Uses of Alternating-Current Potentiometer

SOME one has said that a new truth or doctrine has to pass through three stages—first, people say that it is impossible, then that it contradicts the Bible; finally they assure every one that they have always believed it. A somewhat similar fate usually befalls a new engineering method or appliance when it is introduced via physical laboratories. Many at first have no use for it and are irritated even when it is mentioned. Later they condescendingly admit that it may be all right, but say it does not fit their testing-department routine instructions (A.D. 1890) and blanks. Finally, they not only adopt the innovation, but in their enthusiasm are likely to go too far and for the sake of standardization use it even where it is not theoretically sound. Oscillographs and direct-current potentiometers are well-known examples of appliances which had a long fight for recognition before they became every-day tools in large operating companies.

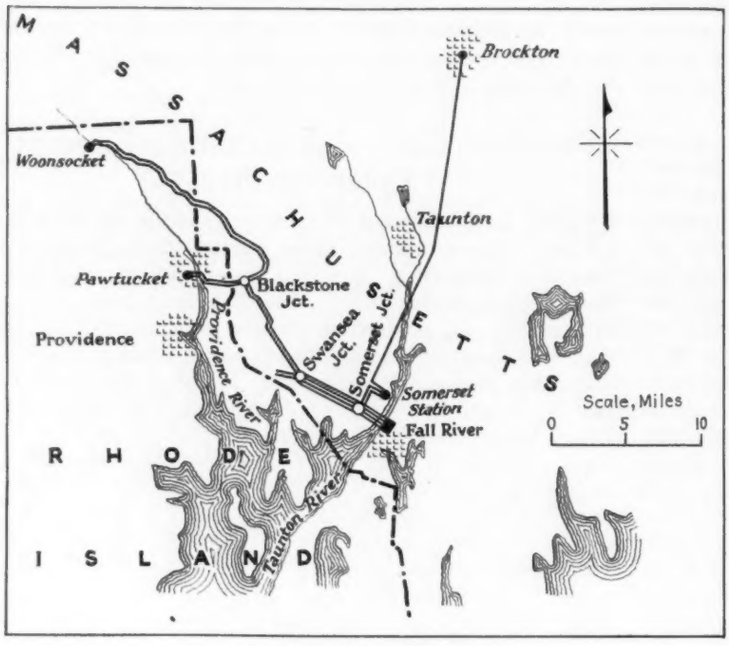
Engineers are now about to welcome—or to resent the intrusion of—another newcomer which knocks at the gates of testing departments of well-organized operating companies, namely the alternating-current potentiometer. In the March issue of the *Journal of Optical Society and Review of Scientific Instruments* (Vol. 12, page 217) Mr. Spooner describes several practical applications of such a device, for example, core loss and magnetizing-current measurements, determination of the ratios and phase angles of instrument transformers, inductance measurements, tests on audio-transformers and amplifiers, magnetic analysis, etc. This device should come to the attention of engineers who have to perform alternating-current measurements of precision. The alternating-current potentiometer is by no means a new instrument, having been known to physicists for a number of years. The time seems ripe to introduce it into the industry, and it is to be hoped that American instrument makers will help to develop types suitable for the specific needs of power and communication engineers.

Montaup System an Economic Benefit to Southeastern New England

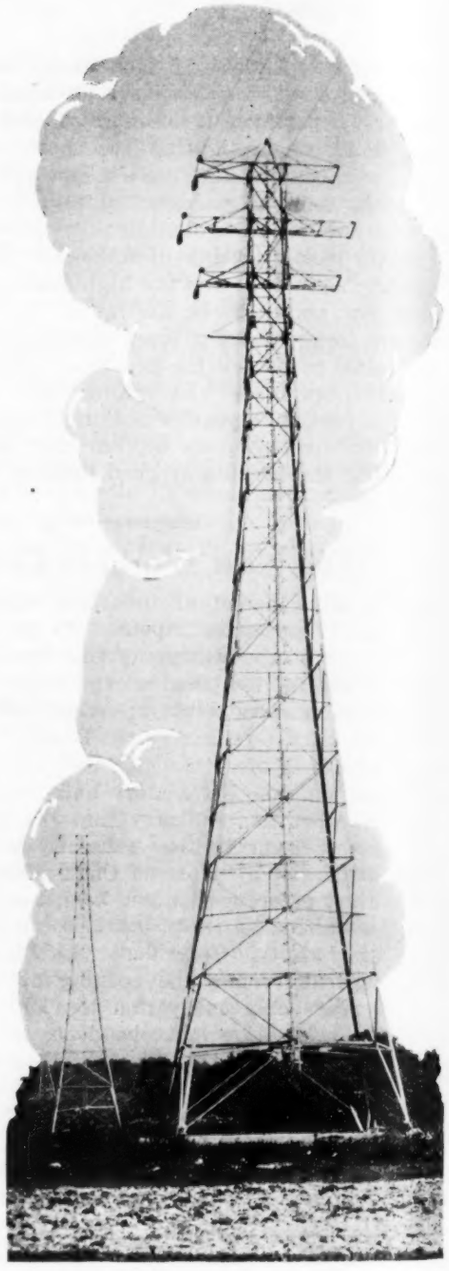
AN UNUSUAL interconnection between a tidewater steam plant and adjacent power markets is illustrated by the Montaup Electric Company of Massachusetts. Growth of loads on the systems of the Blackstone Valley Gas & Electric Company of Pawtucket and Woonsocket, R. I., the Edison Electric Illuminating Company of Brockton and the Fall River Electric Light Company led these utilities to create the Montaup system under common ownership, with a new station of at least 200,000 kw. ultimate rating at Somerset, Mass., on the Taunton River, and the intercompany 66-115-kv. transmission lines shown on the accompanying map. Special legislation was required to achieve this tri-company project*, which was built by Stone & Webster, Inc., Boston, for these utilities.

Early experience in operating this system indicates that at least $3,000,000 in plant investment by the separate companies has been saved by taking advantage of the diversity of loads on the three systems and pooling generating capacity through tie lines based on Somerset. There is also evidence that within ten years at least $2,000,000 will be saved in power costs to Fall River mills in contrast with buying energy from outside the Montaup system. The Somerset station, with one 30,000-kw. initial unit, is operating at a little below 15,000 B.t.u. per kilowatt-hour.

*The intercompany agreement was published in the ELECTRICAL WORLD, Dec. 22, 1923.

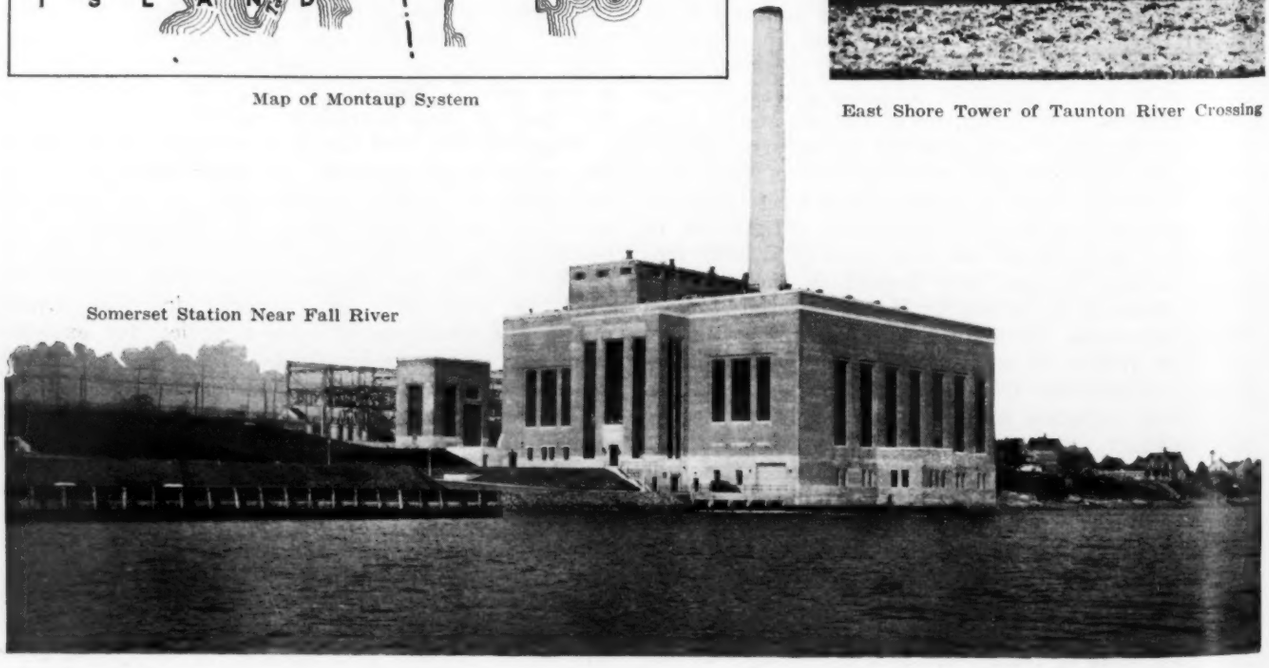


Map of Montaup System



East Shore Tower of Taunton River Crossing

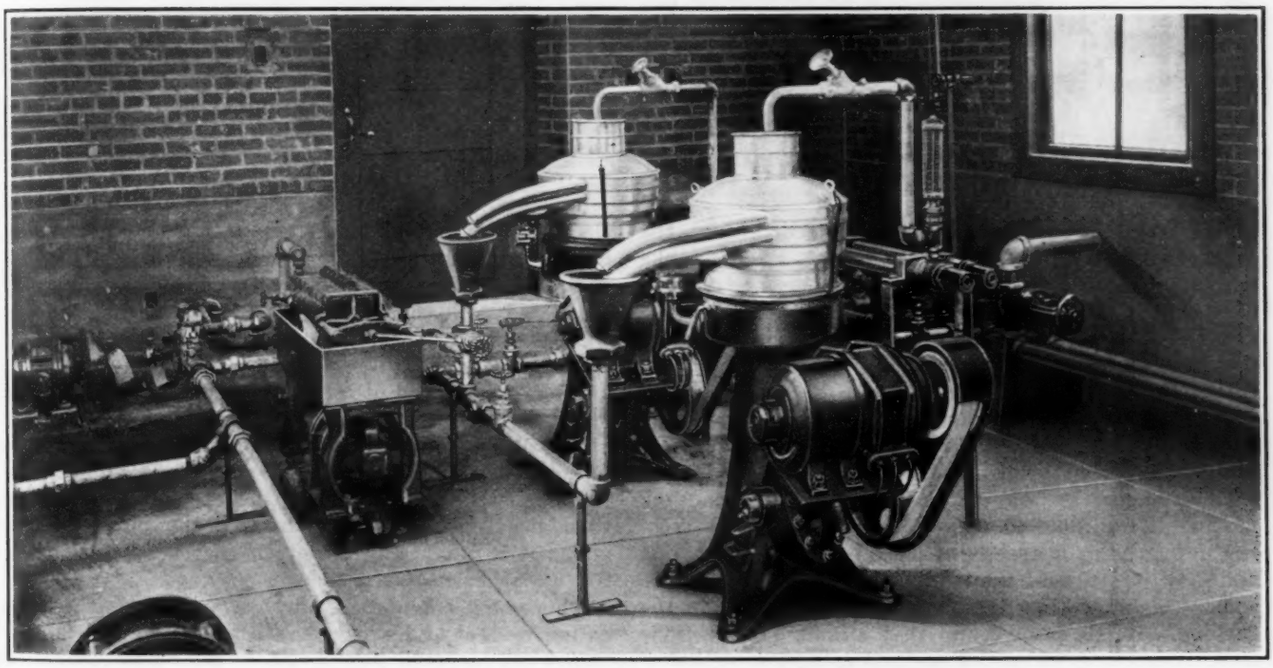
Somerset Station Near Fall River



Oil Purification at Kearny Plant

Systems for Purifying Turbine Lubricating Oil and Transformer and Circuit Breaker Insulating Oils at New Generating Station of the Public Service Electric & Gas Company at Kearny, N. J., Are the Result of Several Years of Study

By D. F. MILLER and R. H. OSGOOD
Turbine Equipment Company, New York, N. Y.



TRANSFORMER AND CIRCUIT BREAKER OIL PURIFIERS AT KEARNY

THE problem of how best to maintain the lubricating efficiency of turbine oil and the dielectric strength of insulating oil has for a number of years received a great deal of attention from the engineering staff of the Public Service Production Company of Newark, New Jersey. Many of the practices which this study has shown to be advantageous have already been put into effect in existing plants of the Public Service Electric & Gas Company, but it has remained for the building of the new super-power station at Kearny, N. J., to give a suitable opportunity to lay out entirely new systems in strict accordance with the ideas developed by the Production company's engineering staff.

Two separate installations, each employing centrifugal machines, have been provided to purify the oil in use. One of these is located in the boiler house basement to purify lubricating oil. The other is located in the outdoor substation to dehydrate and purify transformer and circuit breaker oil.

Kearny station is now equipped with three General Electric turbo-generators, each having a capacity of 39,200 kva., and two Westinghouse machines of 43,750 kva. per unit. Plans call for a future installation of five more turbo-generators of the same capacities or larger. The General Electric units have self-contained oil reservoirs of 1,500-gal. capacity each and the Westinghouse machines have similar reservoirs, each holding 1,000 gal. The turbine oil system is arranged so that each unit has its own dirty-oil receiving tank, one clean-oil receiving tank of the same size as the dirty-oil tank, a No. 600 motor-driven De Laval oil purifier and a motor-driven return oil pump; thus making a total of five complete oil-purifying units in this first construction step.

Some of the advantages of this layout are as follows:

First: The oil in each turbine may never become mixed with the oil in any other turbine. For this reason any difficulties which may arise can easily be isolated and corrected.

Second: Large tanks permit used oil to be stored over a sufficient period of time for rest and precipitation, without interrupting the operation of the turbine from which the oil came or tying up the oiling system of any other turbine.

Third: The clean oil storage tanks enable the operator always to have on hand a clean charge of oil to replace in a very short time the dirty oil removed.

Fourth: A bypass arrangement makes it possible for the service oil to be circulated through the purifier while the turbine is in operation, water as well as solid material being continuously removed. This is a particular advantage at times when steam leaks bring water into the oil.

Although the lubricating system of each turbine is entirely separate, provision is made for transferring

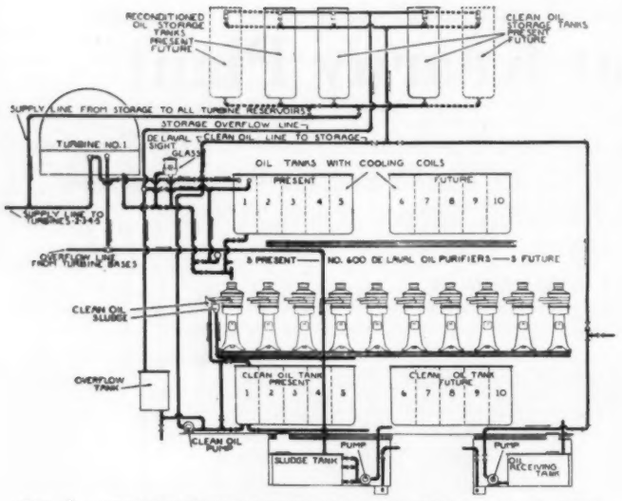


FIG. 1—ARRANGEMENT OF TURBINE OIL-PURIFYING SYSTEM, PRESENT AND ULTIMATE

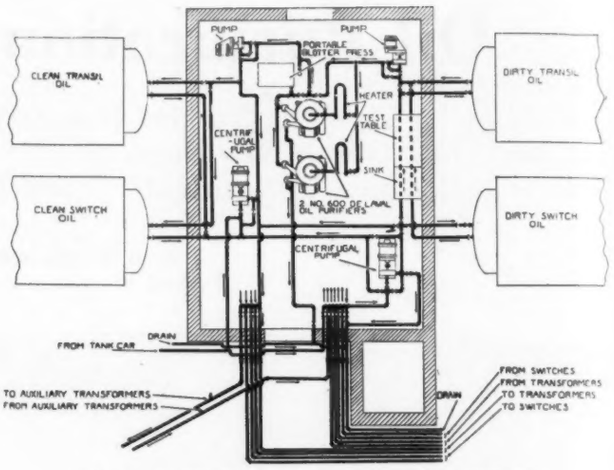


FIG. 2—LAYOUT OF TRANSFORMER AND CIRCUIT BREAKER OIL SYSTEM

the oil from one unit to another if desired through the overhead storage tanks shown in Fig. 1. These tanks normally are out of the lubricating system and will be used only to hold a reserve supply of oil which may be dropped into the reservoir of any unit at will, thus providing a means by gravity of rapidly refilling any turbine after it has been drained.

It has been the experience that continuous bypass purification of turbine lubricating oil makes possible a dry and clean system. It is true, however, that soluble impurities sometimes accumulate in the oil, making it desirable to remove the entire charge from the unit, giving it as long a period as possible to rest and precipitate, and then purify it at a temperature somewhat lower than that at which it operates in the turbine. It has been found that although the soluble impurities removed by this method of operation are of no great consequence so far as the bearings are concerned, they do have an affinity for cold surfaces and precipitate rapidly in the oil cooler, coating the coils, preventing proper heat transfer and thus leading to higher bearing temperatures. Sludge affects the resistance of the oil to emulsion, thus its removal improves the demulsibility, or R. E. value, of the oil.

By referring to Fig. 1, it will be seen that the system at Kearny permits the oil in each turbine to be handled in almost any manner that may be considered advisable. In case the condition mentioned in the preceding paragraph arises, the oil can, for instance, be dropped from the turbine into the storage tank above the purifier and there be allowed to rest and precipitate. Meanwhile the turbine from which the oil was taken may be operated with another charge of oil dropped from one of the overhead storage tanks or pumped up from its own clean-oil storage tank below. By means of piping which bypasses the tanks this fresh charge of oil may be purified on the continuous bypass method by the oil purifier connected with that particular turbine without in any way interfering with the original batch of oil which is being given a rest.

When the charge of oil in the precipitation tank has had sufficient period of rest, the circulation of the operating oil through the bypass and the purifier may be discontinued, and the purifier put to work on the oil in the rest tank. The oil in the precipitating tank is then cleansed by passing through the purifier, after which it is pumped to the overhead reserve tank ready for use when required.

This is but one of the many ways in which the lubricating system at Kearny may be operated and is cited somewhat in detail here to show the ample provisions made for maintaining the purity of the oil, the handling of it efficiently in and out of the generating unit and the general flexibility of the oiling system as a whole.

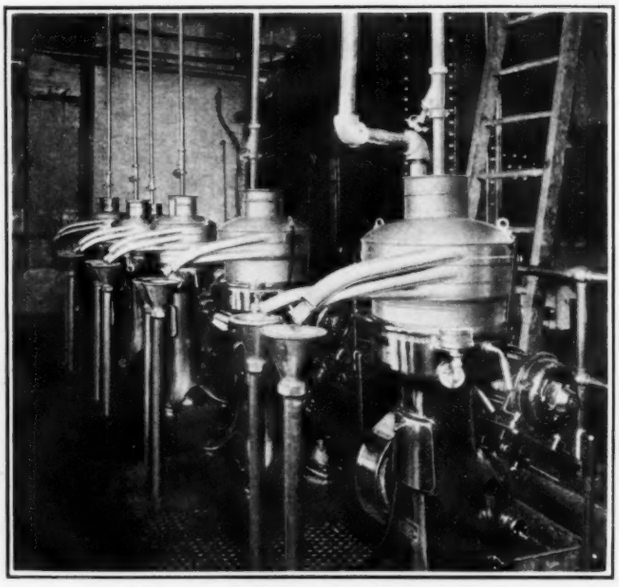


FIG. 3—OIL PURIFIERS AT ESSEX PLANT OF PUBLIC SERVICE COMPANY

The outdoor substation at Kearny presents an entirely different oil-handling problem. Instead of having to remove a comparatively large quantity of sludge and water from the oil, as in the case of the turbine lubricating system, the installation in the transformer yard is designed to remove a comparatively small quantity of water and solid matter from the oil. The percentage of impurities which the oil may safely contain is, however, exceedingly low, hence great care has been exercised in laying out the system.

The oil-handling system at the Kearny substation has as its principal feature the permanent connecting of each transformer and oil circuit breaker by means of pipe lines to an oil-purify-

ing plant at a central point. This eliminates the loss of a great deal of time in making oil connections and in moving oil-purifying apparatus about the yard. The geatest benefit, however, will probably be that it entirely overcomes the trouble experienced in handling insulating oil outdoors at times when weather conditions are unfavorable, and also makes it possible to employ as many dehydrating units as desired at the central cleaning plant. At Kearny it will be possible to circulate the oil in a transformer or switch in about half the time usually required.

Fig. 2 shows the general layout of apparatus and oil lines in the transformer yard, and Fig. 3 shows the arrangement of the oil-purifying plant itself. Four tanks, each having a capacity of 7,700 gal., are located outside the oil house. One of these is for dirty circuit breaker oil, one is for dirty transformer oil and the two others are provided to store the oil after it has been purified or as it is received from tank cars. The tanks are located above grade, requiring two 100-gal.-per-minute centrifugal pumps to transfer the oil from the oil circuit breakers or transformers to the storage tanks.

The system is arranged so that the oil from transformers and oil circuit breakers may be pumped into the dirty storage tanks and the units refilled from clean oil storage, or the oil may be circulated through the oil-purifying plant while units are in service by bypassing the storage tank system.

Rotary pumps having a capacity of 15 gal. per minute are employed to circulate the oil and handle it in the purifier house. Except for a short run in the oil house, separate headers are used for transformer oil and circuit breaker oil so that the two products will not become mixed, and the headers are sealed in such a way that they are kept filled with oil at all times. This insures that when the oil in a transformer or oil circuit breaker is being circulated the unit will always receive back the same quantity of oil that is taken from it. It also keeps the pipe lines free from sweating on the inside.

In addition to the oil purifiers, the purification plant is equipped with a blotter press of the portable type. This is provided to operate in series with the centrifugal machines in purifying badly carbonized switch oil, in cases where a visual inspection of the oil shows that it contains an unusually large amount of colloidal carbon. In all other cases the centrifugals will do the work unassisted. It should be noted, too, that since the oil in these special cases will go first through the centrifugal machines and then to the blotter press, the latter machine will not be called on to take any moisture out of the oil and consequently should operate with little attention.

Most features of the turbine-oil purifying system at Kearny station have been previously tried out at other Public Service plants where they have proved their merit.

The use of the oil purifier is not new to the Public Service, as they have been in use there for a considerable period, but the method of installation with its flexibility of service is the interesting feature and similar installations are going into service at Essex and Marion stations.

A portable De Laval oil purifier with a blotter press as described above has also been installed in the switch house to purify auxiliary substation transformer and switch oil.

Economies Effected by Standardizing Outdoor Substations

STANDARDIZED outdoor substations are being used extensively by a Middle Western utility in serving small and medium-sized communities and also industrial customers. Before they were standardized requests for service required either that the engineering department design a substation or that the construction crew put one up without engineering instructions. The first procedure required several hours of the engineering department's time for design, making estimates and writing requisitions. The second procedure sometimes resulted in more expensive structures than necessary and in a multiplicity of types.

Since standardization of the substations, the engineering department can immediately estimate the cost of new structures, based on the structure expense plus transformers, and issue instructions for construction without special design, and is also able to write requisitions quickly, because they are standardized. The amount of material required in stock has been reduced and simplified. Less time is required in issuing the stock, because it becomes a routine and not a special job. Less wastage occurs, because demands are definite. Becoming familiar with the erection of two types of substations, which may be modified to meet local conditions, the construction crews can make greater speed.

As a result substation facilities can be provided within a much shorter time than formerly after notice of need. If repairs or replacements have to be made, the materials or equipment can be quickly secured from the standardized stock and the work can be completed quickly because of familiarity. Inspection is obviously facilitated, and operating and life hazards are reduced, because there is not a multiplicity of conditions to be encountered.

Two types of substations are employed, Class A and Class B (see pages 804 and 805 for plant layouts and lists of material). Class A is employed for 33,000-volt primary service with transformers mounted on the ground. Class B is employed for transformers mounted on elevated platforms in sizes up to three 100-kw. units. These substations are designed for different makes of outdoor equipment, so the company is not bound to use only one manufacturer's equipment. The design is susceptible to modifications on the job where necessary. The parts come already prepared for assembly. Even the meter boxes in the 33,000-volt substations are ready equipped and wired and conduits bent for installation.

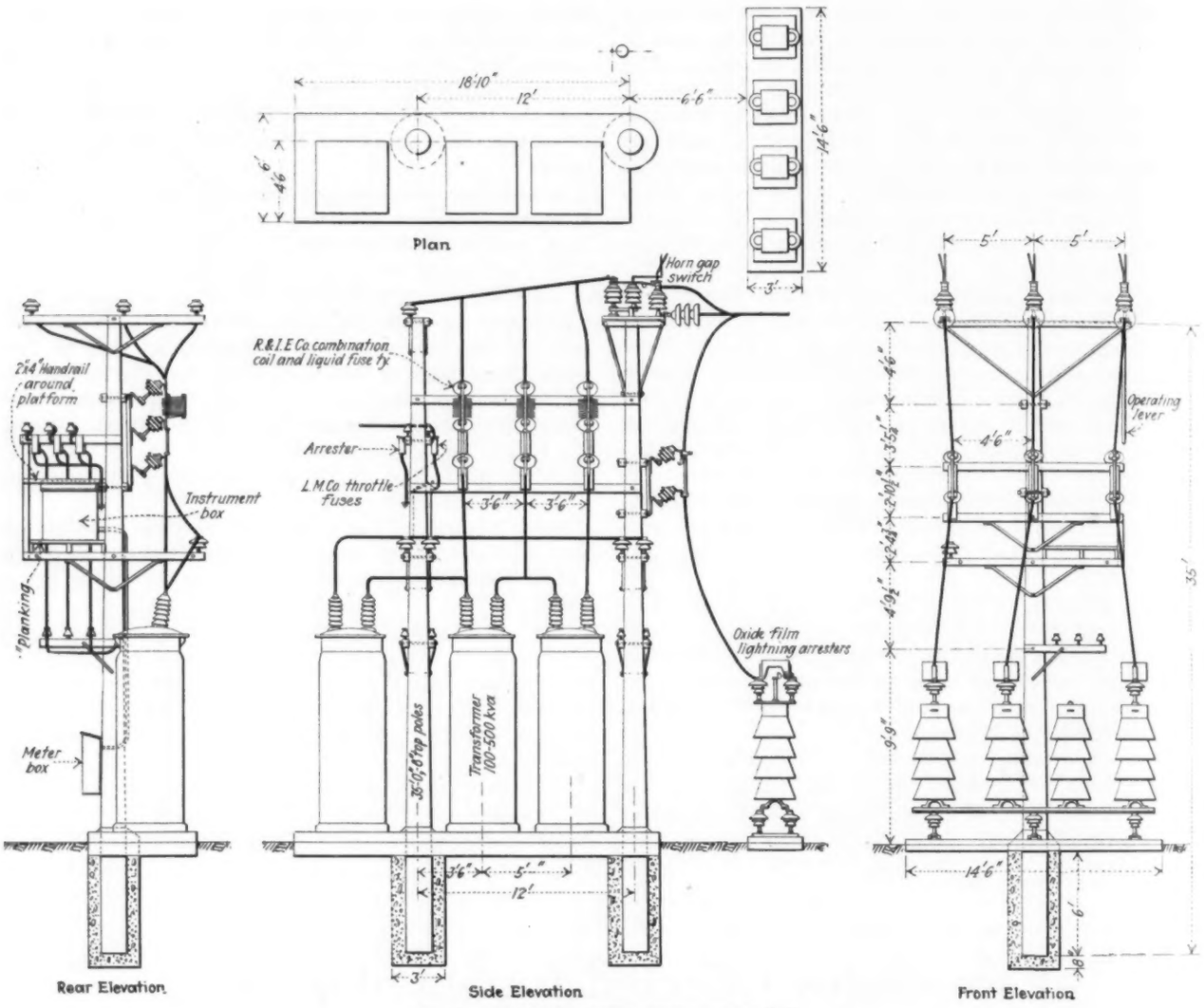


FIG. 1—STANDARD SUBSTATION, TYPE "A"

Table I—Material List Class "A" Substation

Three lightning arresters, 2,300 volts, G. E. Type FA, Catalog No. 149757
One lightning arrester, 37,000 volts, G. E. oxide film, Catalog No. 1576241
Transformers, G. E. Type H, Form KD, 33,000 volts—2,300/4,000 volts Y.
Four 2½% voltage taps:

50 kva., Catalog No. 204639	150 kva., Catalog No. 204643
100 kva., Catalog No. 204641	200 kva., Catalog No. 204644

One air break, pole top switch, three pole, 33,000 volts

R. & I. E. Co., Type IB-2	Delta Star, Type PMT-36
200 amp., Catalog No. 13619	200 amp., Catalog No. 234,000, with channel iron base same as supplied on Type PM-36

One steel switch mounting for above (from storeroom)

For IB-2 switch	For PMT-36 switch

Three disconnect switches, single pole, 33,000 volts, 300 amp.

R. & I. E. Co., Type DV-2, Catalog No. 13,204	Delta star, Type G-2, Catalog No. 65120

Three combination choke coils and fuse mountings, 33,000 volts.

R. & I. E. Co., Type (CB-FL-V) 2 200-amp. choke coil, Catalog No. 17117	Delta star Type G-43 100-amp. choke coil

Specify size of fuse to be used

For fuses	Catalog No.
6- 10 amp.	65441
11- 25 amp.	65442
26- 50 amp.	65443
51-100 amp.	65444

Three S. & C. fuses, 33,000 volts.

10 amp., Catalog No. 16154	30 amp., Catalog No. 16404
15 amp., Catalog No. 16214	40 amp., Catalog No. 16414
20 amp., Catalog No. 16224	50 amp., Catalog No. 16424
25 amp., Catalog No. 16234	60 amp., Catalog No. 16504

Three fuse cutouts, 2,300 volts.

Throttle fuses, L. M. Co.,	D. & W. oil cutouts, G. E.
100 amp., Type W-66-C1	300 amp., Catalog No. 230008
200 amp., Type W-66-C2	

Three fuse links for above

For throttle fuse		For D. & W. cutouts		
Amp.	Catalog No.	Amp.	Standard Link	Reactive Link
30	W-30			
40	W-40	200	Catalog No. 235606	Catalog No. 235667
50	W-50	250	Catalog No. 235608	Catalog No. 235669
60	P-60	300	Catalog No. 235610	Catalog No. 235671

Amp.	Catalog No.	Amp.	Catalog No.	Amp.	Catalog No.
70	P-70	140	P-140	180	P-180
100	P-100	160	P-160	200	P-200

Four pieces No. 1 yellow pine or fir, 4 in. x 6 in., 14 ft. long. (Supports for choke coils)
Three pieces same, 2 ft. x 6 in., 16 ft. long. (Joists for platform)
Five pieces same, 2 ft. x 8 in., 18 ft. long. (Flooring for platform)
Two pieces same, 2 in. x 4 in., 14 ft. long. (Railing)
One piece same, 2 in. x 4 in., 16 ft. long. (Railing)
Two pieces 2 in. x 10 in., 20 ft. long, No. 2 common yellow pine. (Foundation forms)
Two pieces 2 in. x 10 in., 10 ft. long, No. 2 common yelllow pine (Foundation forms)
Two pieces 2 in. x 4 in., 16 ft. long No. 2 common yellow pine. (Foundation forms)
Ten cross-arms, 3¼ in. x 4½ in. x 10 ft. 0 in., four-pin.
Six cross-arms, 3¼ in. x 4½ in. x 8 ft. 0 in., six-pin.
Six through bolts, ¾ in. x 18 in.
Eight through bolts, ¾ in. x 20 in.
Four through bolts, ¾ in. x 22 in.
Twelve D. A. bolts ¾ in. x 18 in.
Sixteen D. A. bolts ¾ in. x 20 in.
Eight D. A. bolts ¾ in. x 22 in.
125 square washers, 2½ in. x 2½ in. x 13/16 in. hole
Four cross-arm braces, 1½ in. x ¼ in. x 28 in.
Eight "U" braces, angle iron, 5 ft. Hubbard No. 7942
Twenty-five lag bolts, ½ in. x 4 in.
Six carriage bolts, ¾ in. x 4½ in.
Thirty-six carriage bolts, ½ in. x 6 in.
Thirty-six round washers, ½ in.
Five lb. 8-penny nails
One lb. 12-penny nails.
Seven Keystone truss pins, No. 44126
Seven insulators, 33,000 volts, Locke No. 1044
Eighteen locust pins, 1½ in. x 9 in.
Eighteen insulators, 2,300 volts, Locke No. 44
Two meter boxes
One cyclone fence, 25 ft. x 35 ft.

Concrete Foundation, Mixture 1:3:5

One and one-half yd. stone
Five and three-quarters in. sand
Sixty sacks cement
Five gal. olive green paint
Two padlocks

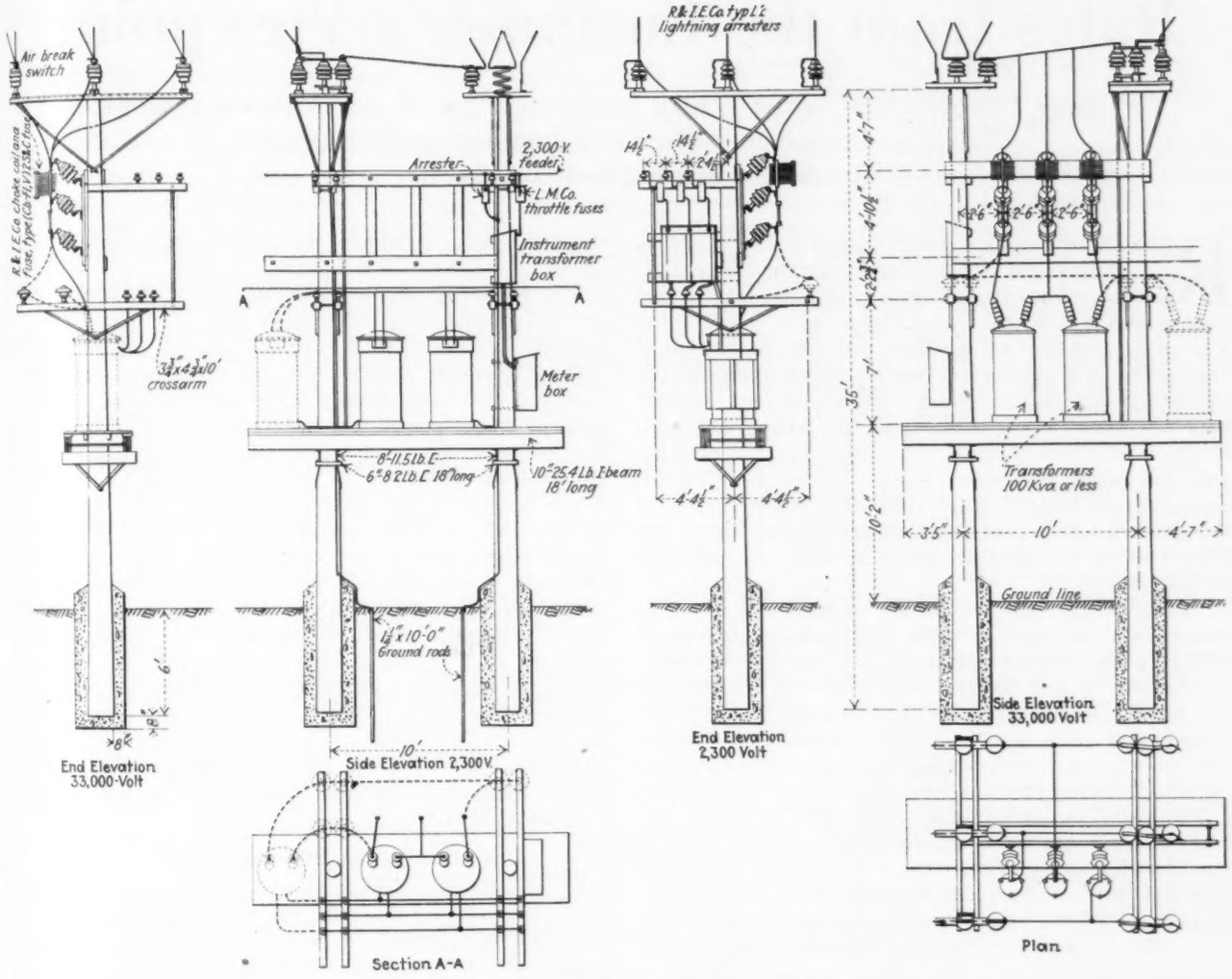


FIG. 2—STANDARD SUBSTATION, TYPE "B"

Table II—Material List Class "B" Substation

Quantity	Material	Make	Type	Catalog No.
	Electrical Equipment			
	Transformers 33,000/2,300-4,000 volts Y	G. E.	H	
1	Air break switch, pole top 37,000 volts	R. & I. E.	IB-2	13619
	Three-pole, 200 amp.	Delta star	PMT-36	234000
3	Lightning arresters, pole top 37,000 volts	R. & I. E.	L-2	16038
		S. & C.	H-Form 1	40114
3	Combination choke coil and fuse units	R. & I. E.	(CB-FL-V) 2	17117
	37,000-volt, 200-amp. choke coil	Delta star	G-43	6-10A.65441 11-25A.65442
3	Liquid fuses, 37,000 volts	S. & C.		10763
3	Lightning arresters, 2,300 volts	G. E.	OF-Form P	2515514G1
3	Throttle fuses, 2,300 volts	Line material		W 6601

Cross-Arms, Insulators, Platform, etc.

One steel switch mounting for IB-2 switch, Drg. S-14 For PMT-36, Drg. S-21
Two 10-in., 25.4-lb. I-beams 18 ft. 0 in. long
Four 8-in., 11.5-lb. channel irons 4 ft. 4 in. long
Four 6-in., 8.2-lb. channel irons 1 ft. 6 in. long
Three ¾ in. x 3 ft. 9 in. rods, threaded 3 in.
Three 1½ in. x 3 ft. 6½ in. pipes
Four 1½ in. x 7 ft. 0 in. pipes
Eight ¾ in. x 1½ in. x 2 ft. 7 in. strap iron braces
Six Hubbard angle-iron U braces 5 ft. long. Catalog No. 7942
Four Hubbard alley arm braces 1½ in. x 1½ in. x 6 ft. 0 in. Catalog No. 7982
Six cross-arms, 3½ in. x 4½ in. x 10 ft. 0 in., four-pin
Six cross-arms, 8 ft., six-pin
Six Keystone truss pins, No. 44126
Twenty-four insulator pins, locust, 1½ in. x 9 in.
Six insulators 37,000 volt, Locke No. 1044
Twenty-four insulators 2,300 volt, Locke No. 44
Two ground pipes, 1½ in. x 10 ft. 0 in.
Six pole shims, 4 in. x 8 in.

Timbers and Hardware

Two poles, 35 ft. 9 in. top, W. R. treated
Two 4 in. x 6 in. x 12 ft. 0 in. timbers
Two 4 in. x 6 in. x 14 ft. 0 in. timbers
Two 1 in. x 4 in. x 5 ft. 0 in. timbers
Six 2 in. x 8 in. x 18 ft. 0 in. timbers
Ten ¾ in. x 20 in. machine bolts
Eight ¾ in. x 20 in. machine bolts
Eight ¾ in. x 22 in. machine bolts
Eight ¾ in. x 14 in. machine bolts
Ten ¾ in. x 20 in. D. A. bolts
Eight ¾ in. x 22 in. D. A. bolts
Four ¾ in. x 4 in. carriage bolts
Four ¾ in. x 6 in. carriage bolts
Ten ½ in. x 4 in. lag bolts
Eight ¾ in. x 2½ in. machine bolts
Thirty-six square washers, 2½ in. x 2½ in. x 11/16 in. hole
Thirty-six round washers
Two yd. crushed stone
One yd. sand
Fourteen sacks cement
Five gal. olive green pole paint

Metering Equipment

Two G. E. current transformers
Two G. E. 2,300-volt potential transformers
One G. E. three-phase watt-hour meter
Two meter boxes, Drg. S-7
Six ft. 1½-in. conduit
Two poles, 35 ft. 9 in. top W. R. C.

Rates from the Customer's Viewpoint

Tendency Toward Rate Forms Which Encourage Use of Service—Psychological Effect on Customers—Need and Justification of Rates for Developing New Loads

RATE structures for electric service as an aid in promoting new or additional loads for the central-station companies are receiving more careful and analytical attention than ever before, as it is becoming well recognized that the form of rate and its method of application to a particular class of business may be the turning point upon which a prospective user may or may not become a customer of the power company. Some of the fundamental principles of rate making, with particular reference to the customer's viewpoint, were outlined by C. S. Reed, consulting engineer, before the general meeting of the Commercial Section of the East Central Geographic Division, N.E.L.A., at Cincinnati on Feb. 24.

Primarily any rate for electric service, if it is to be attractive to prospective users of electric energy, must take into consideration what the customer can economically afford to pay for the service and at what figure the electric utility can afford to render that service. Rate making resolves itself into a problem of finding the easiest way of distributing and balancing a burden, of administering the best relief for a common problem.

This principle should be the basis of all electric rates. The company has made an investment in plant, meters and distribution system. It is entitled to operating expenses plus a replacement allowance plus a fair return and the job of the rate maker is to collect the total sum from the customers in the way that is easiest on the customers themselves.

When the electric companies were new, the bulk of the load was lighting and the peak came during the shopping period just before Christmas. It was necessary to design the plant to take care of this Christmas peak, even though part of the resulting capacity stood idle all the rest of the year. In order to put this idle capacity to work the operators decided to sell power at much lower rates, many of these rates being less than the then cost of doing business, being based on the additional cost of the additional business.

An Equine Analogy

Of recent years this power load has grown until it is now, in most cases, far more than the lighting and our peaks come in the morning instead of at night. The lighting load is now off-peak load for many companies. One of the effects of this change has been to upset many of the cost analyses that are supposed to be back of our rate structures.

Recently the Public Service Commission in a neighboring state sent out an order to each of the electric companies asking for a detailed report showing the rate of return on each class of business. In most cases such a report will show a high rate of return, 12 to 16 per cent, on the lighting load and a low rate of return on power. There is the possibility of it being used therefore to cut lighting rates at the expense of the power users, for the benefit of the politicians and to the ultimate detriment of the lighting customers themselves.

The following analogy was prepared to illustrate the justice of continuing the present scheme:

Three horses are hitched to a wagon—Tom, Dick and Harry. Each of them carries upon his back sufficient food and water for his own needs and each also helps to pull the wagon containing the common load. The progress of our wagon is not as good as it might be and so we analyze conditions in detail to determine if each horse is pulling his share of the load. By means of balances, etc., and by observation we discover that Tom is pulling one-half of the weight of the wagon, whereas Dick and Harry are each pulling only one-fourth. Our examination further reveals that Dick's harness is weak and will break if much additional pull is applied. So, although Dick is just as strong and healthy as Tom, he is taking advantage of the weak harness to pull less than his fair share. Harry, too, is pulling lightly, but this we find is because he is sickly and not able to pull any more. He can carry his own supplies and can pull 25 per cent of the wagon weight, but he cannot pull his one-third share.

Beneficial Discrimination

Of course, in actual practice, our first act would be to strengthen the harness. Next we might get a new horse to replace the sick one. But suppose for the moment we were unable to do either of these things, but were forced to let harness and horses remain unchanged.

We want, however, to act fairly by faithful Tom, who is pulling twice as much as either of the others. So we apply the whip to lazy Dick to make him pull his share. The result, of course, is that the harness breaks and Dick goes galloping down the road, leaving the wagon to be pulled by Tom and Harry. Then, unless Tom takes over Dick's share and proceeds to pull 75 per cent of the load, sickly Harry must take on some additional work. So we use the whip on Harry, but he cannot stand the gaff, and dies.

Our total load may be lightened, for we are relieved of the burden of food and water that Dick and Harry carried for themselves, but poor Tom is worse off than before, for he is stuck with not only his own load but also all of the weight of the wagon.

If we reverse the procedure and start by trying to make sickly Harry pull more before applying the whip to lazy Dick, the result will be the same in the end.

So we come to the inevitable conclusion that as long as Dick and Harry carry their own food and water and help pull the common load, Tom is better off, even though he is forced to pull more than his share, than he would be if an attempt were made to divide the load equally. This is discrimination, but it is just and equitable discrimination in that the party discriminated against is benefited instead of being hurt.

This analogy is applicable to the public utility busi-

ness in the apportionment of costs and the determination of rates to be charged either by the different departments of a combination utility, such as electric, gas and street railway, or by the various classes of service supplied by a single utility, such as light, power, heating and cooking service.

TOM, DICK AND HARRY IN AN ELECTRIC COMPANY

Our analogy also holds true as regards the different classes of service supplied by an electric company. Tom represents the electric-lighting service, Dick the more competitive power service and Harry some special service such as electric range and water heater business or electric furnace load, which, although they may not be sickly, are still weak through being undeveloped. The original electric companies were almost exclusively lighting companies until they offered power rates that were based upon the acquisition of power load without much of an increase in the overhead expenses. The low electric lighting rates of today are due to the taking over by the power load of some of the overhead and general expenses that were formerly carried by the lighting load.

If we now make a theoretical allocation of the common expenses and base our rates accordingly, we will find that power is not carrying its theoretical share and should pay more. Yet this increase in rates will tend to drive away business and we may have a complete reversal of the process that brought the electrical business to where it is today. Equitable discrimination was one of the most important factors in the building up of the electrical industry and in the bringing about of the low rates now available for lighting purposes.

The same kind of discrimination justifies our selling energy for heating processes at a lower rate than that charged for power. As long as the additional business pays all of the additional costs plus some contribution toward the common expense, it should be accepted. Of course, where the company already has customers using energy for exactly the same purpose but paying a higher rate, care must be used or trouble may be stirred up by a customer who does not realize how he is being benefited by the additional load.

The Tom, Dick and Harry illustration shows how many of our rates can be justly based on what the traffic can most easily bear.

Disregarding the balance of our business and considering only the power branch, we are still confronted with the problem of finding the easiest way to raise a given sum of money from a group of customers. The principle holds true as to form of rate as well as to division of revenue among classes.

COMPARISON OF RATE FORMS

The two extremes of rate form are the straight meter rate of so much per kilowatt-hour metered and the flat fixed sum of so much per month, regardless of quantity used. Between these extremes are a number of other forms, many of which are fearfully and wonderfully made and most of which are just "happenings," having been built up originally to suit the requirements of some individual customers and then modified and remodeled as time went on.

Local conditions affect the rate form to a great extent. A rate that is suitable in one district will not cover conditions in another. It might even be possible to find a locality where a straight meter rate would be the best rate for power purposes, and at almost the opposite extreme we have the Niagara rates of $25 per horsepower per year, regardless of quantity used or of the time of its use.

TREND TOWARD UNIFORM SCHEDULES

In these days of consolidations and superpower, however, the trend is toward uniform schedules, and many of the local special considerations can be forgotten just as the non-uniformities of the cost to serve different customers in the same city due to distance from plant, etc., are merged in a uniform city rate.

From the customer's standpoint, the straight meter rate seems at first glance to be the most desirable form. Some of our power users object to anything in the nature of a demand charge, insisting that we should put a price on our product like any other merchant and sell it at so much per unit. Why be peculiar? In the first place, are we peculiar or are there plenty of similar illustrations in other lines of business?

A. Municipal Government Functions:

1. Using the theory that a customer should pay only for what he gets, at so much per unit, the proper method of charging for fire protection service would be at so much per thousand gallons of water pumped or so much per hour of engine service. Thus the careful man who kept his extinguishers in order would not have to pay for the protection of his careless neighbor. Under such a scheme we might have fewer "fire sales," but it would hardly be an economical proposition. Fire protection is charged for on the basis of the value of the property that the engines stand ready to serve.
2. If a sidewalk is put in front of a vacant piece of property, the owner pays for it, regardless of whether he uses it or not. Similarly with paving.
3. If sewers are installed, the cost of them is assessed against the property owners, even if the property is vacant or if the owner installs his own cesspools and disposal system. The share of the total cost of sewage disposal that varies according to the number of gallons handled is almost as large as the ratio of the bare cost of producing a kilowatt-hour to the total cost of delivering it to the customer. Yet it can be imagined what would happen if any municipality attempted to switch to a meter basis.

B. Union Labor Principles:

Unions do not approve of piece work, but generally demand that men be paid by the hour or day. If an employer contracts with an employee to start work at a certain time and then has no work for him to do until three hours later, the employee is entitled to the three hours pay. He is waiting in readiness to serve his employer.

C. Telephone Business:

The present method of charging of many phone companies is at a fixed readiness-to-serve charge per month. If a telephone company should switch to a straight meter rate of so much per call, it would probably be swamped with installation orders, for everyone would want to have a telephone handy, even if it were never used. The business users, however, would find the price prohibitive. A meter rate would put the telephone company out of business in a short time.

D. Taxicab Fares:

The standard taxicab fare in many cities is on a three part basis, as follows: (1) An operating charge of 40 cents per mile, plus (2) an additional charge of 20 cents for each additional passenger, plus (3) a waiting charge of $1.50 or $2 per hour. The rate for a one-mile ride would be 40 cents. The rate for a one-hour wait plus a one-mile ride would be $2.40. And just what would the rates be if the taxi companies were forced to render good service in stormy weather?

When we investigate, we find that if we are peculiar, the peculiarity lies in our continuing to struggle along with meter rates. If any other line of business were asked to render the kind of service required of us, it would be forced to use a demand rate or go out of business.

We are also peculiar in that we fail to see that our neglect of the ultimate good of our customers is bound to react to our detriment.

The demand charge acts for the customer's benefit. The steady customer who makes use of the equipment devoted to his service is automatically given the lower rate. Then, too, the low energy rate made possible by a high demand charge encourages additional use of energy, which in turn tends toward lower rates.

It is not the intention to go into any detailed cost analysis, but we have learned from these analyses that we lose money on the low load factor customers if we sell on a straight meter rate. In order to get a fair return we are forced to add this loss to the bills of the good load factor customers, and as a result our rate is too high to get the proper kind of business.

Another feature of the demand type of rate is that it follows competitive costs. The customer who supplies his own power has his investment costs, which are constant regardless of whether or not he makes use of his equipment. The interest and depreciation automatically make up a demand cost that is not monthly or yearly, but continues indefinitely.

Then, too, if a straight meter rate is used, we are compelled to make more than a fair return in prosperous times in order to make up for lack of return during business slumps. During the prosperous periods the customer is better fixed financially and can compel lower rates, either through threat to build his own plant or by complaining to the commission.

On the other hand, the demand charge, when calculated on its proper basis of twelve months or longer, means a less return on power during prosperous times to offset the larger returns on lighting, and it also means a higher return during dull periods, when the sales and load factor decrease.

THE SUGAR-COATED PILL

Having convinced ourselves of the necessity for a demand charge, the next step of some of us is to dress it up so it will be better received by the customer, to make our medicine more palatable by sugar coating. Two ways of doing this are by disguising the demand charge in the first few hours use of the demand or by buying the charge in a much longer hour use block. An example of the first type would be:

For the first 40 hours' use of the demand per month, per kilowatt-hour, 6 cents; for all additional energy, per kilowatt-hour, 1 cent; minimum bill, 30 hours' use of the demand.

There being a spread of 5 cents between the two blocks, we have a demand charge of 40 times 5 cents or $2 per kilowatt, so our rate is really $2 per kilowatt plus 1 cent per kilowatt-hour.

This same rate in the second type would be:

For the first 200 hours' use of the demand, per kilowatt-hour, 2 cents; for all additional energy, per kilowatt-hour, 1 cent. For this latter type the expression "Burying the demand charge" is very appropriate, for in most cases the demand principal is nearly if not entirely dead. The customer who uses his demand only 100 hours gets by on one-half his proper charge and some other customer has to contribute more than his share. The first block should be made short enough so that each customer pays his demand costs.

Sometimes the demand charge is sweetened by including 10 or 20 kw.-hr. with it. The only objection to this and the other forms that differ from an out-right demand charge is that some regulating officials find these features are convenient publicity toys and they keep adding to the free kilowatt-hours until the force of the demand charge is almost nullified.

The tendency today, if we may judge from an examination of the N.E.L.A. Rate Book, is toward an out and out demand charge. Less than 15 per cent of the larger companies have stuck to the block and step rates. Optional rates, for primary power at least, have been largely eliminated.

The next point to consider is the method of measuring the demand. Shall we use the one-hour demand on a monthly basis or the instantaneous demand on the yearly or contract basis? Here again we have to consider the viewpoint of the customer. We have a given amount of revenue to raise. If we use the one-hour demand, our units of measurement will be less in number than if we use the five-minute demand, and our price per unit will therefore be higher on a one-hour basis. The steady customer, therefore, will help to carry the costs of the intermittent user. The trend today seems to be toward the fifteen-minute demand as the shortest time interval that can be conveniently measured. Sometimes an addition is made for spot welders and similar instantaneous demand apparatus.

Similarly the use of a twelve-months demand rather than one based on a shorter period will react to the benefit of the steady customer by bringing about a lower demand charge. The use of a twelve-months demand basis is equivalent to from 10 to 20 cents per kilowatt of demand charge.

KILOVOLT-AMPERE DEMAND BASIS

The question of power factor has been attracting more and more attention until today most large power rates contain a clause covering it, and some are considering the installation of straight kilovolt-ampere demand rates. Incidentally, this type of rate has a good psychological effect in that it sounds cheaper. For instance, a rate of $2 per kilowatt on an 85 per cent power factor basis is equal to $1.70 per kilovolt-ampere and it is easier to argue with a customer over the number of units he has rather than over the price per unit. Similarly with hours' use rates, 170 hours' use of the kilovolt-amperage being equal to 200 hours' use of the kilowatt demand.

There are, of course, many other questions involved in a discussion of power rates, such as demand-limiting meters, the use of horsepower-hours instead of kilowatt-hours, the estimating instead of the measuring of demand, the use of dual meters, off peak and on peak, the question of discounts on demand and energy charges for large customers and the proper rates for emergency power. These are more or less local questions and can be omitted from this discussion. All of them, however, should be treated from the customer's standpoint, which means according to what the traffic can most easily bear.

Speaking for the designers of residence rates, it might be well to urge the inclusion of a customer charge of $1 or more, preferably more, in all power rate schedules. For the larger power customers, this customer charge covers so small a percentage of the total cost that it has been neglected and rarely appears in a rate structure. Its inclusion will not affect the power business, but it will help sell the customer charge idea for the residence service, where it is an element that is daily growing more important, with the increasing use of domestic appliances of comparatively high demand.

Edgar Discusses Boston Edison Growth and Policies

Tells Electrical League How Company Has Fulfilled Its Obligations to the Public and the Industry—Further Plans for Co-operation with the Electrical Trade

HOW the Edison Electric Illuminating Company of Boston has fulfilled its stewardship and what this signifies for the future was the theme of an address on March 11 by President Charles L. Edgar before the Metropolitan Electrical League of Boston. Introduced by President F. S. Price of the league, Mr. Edgar recounted many interesting experiences from the pioneer days of Edison service, described the development of the system from small beginnings to the present $115,000,000 utility covering 700 square miles of eastern Massachusetts, emphasized the achievements of its engineers in reducing operating costs and outlined the expansion of its service to the public and to the local electrical trade. A noteworthy feature of the address was a frank discussion of the company's policies regarding lamp renewals and merchandising.

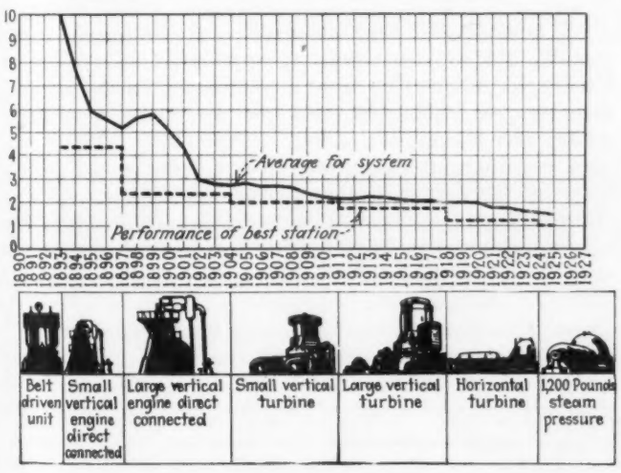


FIG. 1—IMPROVEMENT IN PRODUCTION EFFICIENCY

PLANT EFFICIENCY SHOWS GREAT GAINS

The company was organized in 1885, and with the installation of vertical engine-driven, direct-connected generating units in 1892 a progressive increase in plant economy was inaugurated which reached a figure of about 1 lb. of coal per kilowatt-hour in November, 1925, in the company's Edgar station. Fig. 1 shows the gains in best-station efficiency and in system-generating efficiency on this system for the last 32 years, plotted against the corresponding changes in prime mover types. Due in considerable part to the use of larger and larger steam turbines, the fuel consumption per kilowatt-hour in the best station has been practically cut in two in the last fifteen years. Four types of prime movers have been used in the company's history—horizontal and vertical engines, vertical and horizontal turbines—and the size of the individual unit has increased from 150 hp. to 40,000 hp. The Edgar station, the last word in plant development on the Boston system, is so located that electricity can be distributed from it at 100 kv. or over and areas economically reached that are from 50 to 100 miles distant, the plant also being within reasonable underground distance of the bulk of the Boston and suburban loads. At present the entire Boston district can be supplied from storage batteries for twenty minutes with every generator on the system shut down. The company serves about 250,000 customers in 43 cities and towns, and in 1925 sold 500,000,000 kw.-hr.

The convergence of the curves of energy generated and sold in Fig. 2 indicates a gradual increase in system efficiency through reduction of transmission and distribution losses, and the relation between these curves and the curve of annual peaks shows by divergence the gradual improvement of the system load factor.

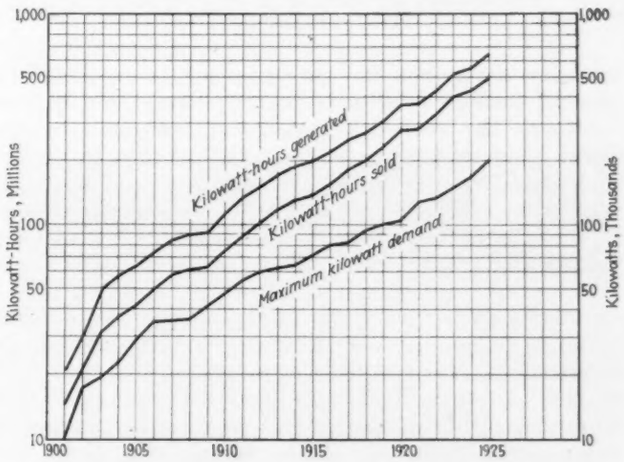


FIG. 2—GROWTH OF OUTPUT, SALES AND PEAK LOADS

The downward trend of electric service prices in Boston contrasted with average wages and the cost of living is shown in Fig. 3. Both the average and the retail prices of electricity are 15 per cent or more below 1913 prices, whereas the cost of living is about 67 per cent higher.

The Boston company enjoys the lowest labor turnover of any in a group of six large utilities compared in Fig. 4, and has held this record for a decade. This indicates the excellence of the relations between the employees and the management, and the company feels that it has fulfilled its obligations in all phases of its development to its customers and to its personnel.

Recently the company has done away with the necessity of a prospective customer's signing an application blank in order to obtain service. Another change making for popular convenience was a decision to leave meters connected and lamps installed on vacated prem-

ises, and this incidentally enabled the company to lay off fourteen trucks and to replace them by four small cars used by men in the accounting department who visit such premises to read meters when vacated.

RELATIONS WITH THE LOCAL TRADE

Turning to the relations of the company with the local electrical trade, Mr. Edgar said in part:

"The natural question for some of you to ask is, 'What effect does our development and our place in the

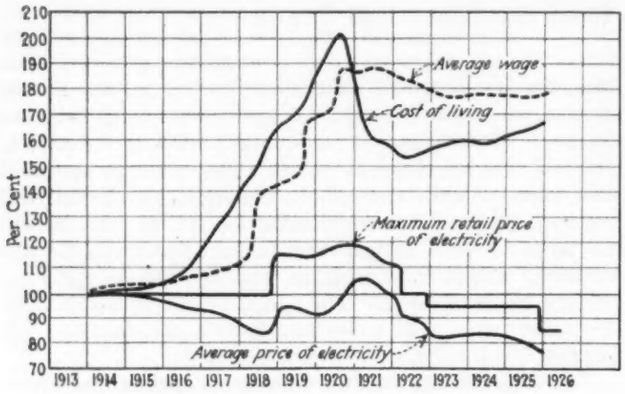

Per Cent
Average wage
Cost of living
Maximum retail price of electricity
Average price of electricity
1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926

FIG. 3—TREND OF COST OF LIVING, WAGES AND PRICE OF ELECTRICITY

industry have upon us and upon our business?' My general answer to this is that the very fact of our existence, the very fact that we or someone else like ourselves have spent more than $100,000,000 in Boston and vicinity during the past 40 years and have succeeded in obtaining 250,000 customers for our circuits means, if it means anything, that you gentlemen have, without any volition on your part, fallen heir to the wiring and fixture business of these 250,000 customers. Our investment and our work end at the customer's premises. Your work carries the customer's installation to its completion. If you will stop to realize that our connected load today is rising 12,000,000 lamps or their equivalent, you will see what a tremendous amount of business has been turned over to you merely by the existence of a company like ours. This probably amounts to more than $75,000,000.

LAMP QUALITY MUST BE MAINTAINED

"Even when it comes to the money spent by our customers for equipping their premises, which, as I have said, all goes to the contractor-dealers, we, because of our size and our resources, have been in a position to help some of the concerns, many of them league members, in getting their share of the wiring business."

Mr. Edgar then outlined the more important co-operative developments undertaken by the company in the past to increase business in the electrical field. After thanking the other branches of the industry for their co-operation, he said, in reference to lamps:

"The question of lamps has been a moot problem for some years. All of the large Edison companies started out on the theory that in order to give good service they must deliver light rather than electricity to their customers. This was because in the early days there were lamps and lamps; some were good, many were bad. The gas companies of the country, by their failure to control the gas mantle lamp, lost tremendous prestige because of the poor service received when the customer purchased inferior mantles.

"For many years the country was flooded with cheap German, Dutch and Japanese lamps. I have actually seen lamps at our laboratory in New York within the past year which were as handsome specimens as I ever looked upon, and yet which took more than three times as much energy per candlepower as our standard lamp. You can well imagine what would happen to the peace of mind of our customers if they loaded themselves up with such lamps and had their bills go up 300 per cent.

"Two of the largest companies in the country some years ago gave up the practice of furnishing free lamps as the result of a regulatory order. The other large Edison companies are still maintaining the lamp-renewal practice the same as ourselves. Although the war prevented the introduction of foreign lamps from Germany and very largely from Holland and Japan, this is likely to be resumed at any time, and the general feeling in the industry is that the two large companies which gave up the free renewal practice will have to get authority to return to it in order to protect themselves and their customers. In the judgment of the management of the company, better results can be obtained for all concerned by handling the lamp question as we are now doing.

CENTRAL STATIONS SHOULD MERCHANDISE

"It is estimated that there are now connected to our circuits $18,000,000 worth of appliances, of which we have sold $4,500,000, the department, hardware and drug stores $3,500,000, and the electrical contractor-dealer the remainder, about $10,000,000. There has been considerable discussion in our industry about the wisdom of central stations either going into or continuing in the appliance business. I think it is the general impression among the thinking people of the industry that the central station by its methods and policy of merchandising can be of distinct advantage to those who are in the business of selling appliances.

"In the first place, you are in the business for profit, and the profit can be obtained only as the result of your construction work or of your appliance sales. We

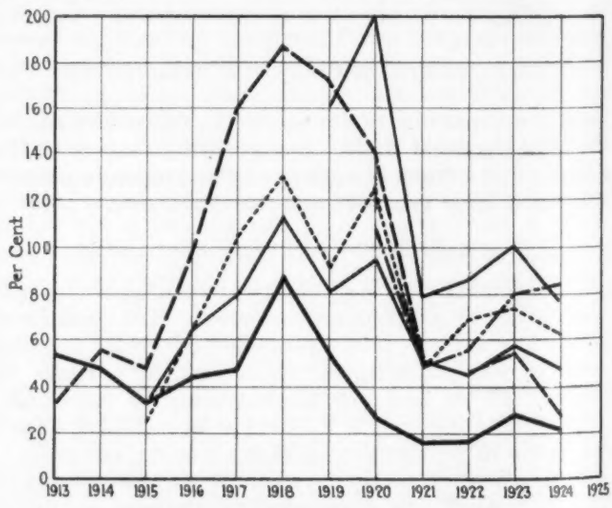


FIG. 4—BOSTON HAS LOWEST LABOR TURNOVER IN GROUP

on our end are in the business of selling energy, and there are many cases where appliances can be introduced, developed and promoted by us in a more liberal way than could possibly be done by you. I am satisfied that by taking our share of the appliance business, selling it at the same prices as yourselves, we are doing

you and the business in general good rather than evil. If, due to our ability in buying at lower prices or of handling at less cost, we are able to make a greater profit than you could have made under the same circumstances, I think it is up to all of us to spend this additional amount in the interests of all concerned. I made this statement some time ago at a meeting in New York called for the purpose of discussing this question in its broadest aspect, and it was the consensus of opinion that my statement really filled the bill.

APPLIANCE SALES AT A PROFIT

"There are some companies in the country that have felt it was more important to sell appliances, even at a loss, for the sake of getting the income from their use. This, in my opinion, is fundamentally wrong. It is distinctly to our interest so to play the game with you gentlemen that you are put under no possible disadvantage by our competition, and if we succeed, because of our relationships with our customers or with the manufacturers, in making more profit than you could have made under the same circumstances, I think we are spending it in the interests of all concerned. Our appliance department has come to the conclusion that there are many items of an appliance nature, especially of the larger and more expensive sizes, that could be handled to better advantage through an arrangement between the company and the contractor-dealer, modeled somewhat after the general scheme inaugurated by the company for house wiring, and we are about to announce a more or less comprehensive plan of co-operation along these lines."

Electrical Ice Cream Cabinets

Average Annual Consumption of 517 Kw.-Hr. Partly Offset by Reduction of Manufactured Ice Load—Refrigerated Fountains May Prove the Best Solution—Complete Electrification of Ice Cream Delivery and Retail Service Expected

By A. D. McLAY
Sales Engineer the Detroit Edison Company

TYPICAL INSTALLATIONS OF ELECTRICAL ICE CREAM CABINETS

THE CONNECTION of 3,500 mechanically refrigerated, electrically operated ice cream cabinets to the lines of the Detroit Edison Company has been accomplished through the co-operative efforts on the part of refrigerator manufacturers and the utility company, working with ice cream manufacturers, to equip retail ice cream parlors with a more satisfactory and economical refrigeration service. More than two years' experience in developing this business has uncovered the limitations of this field and has indicated the most profitable lines of future co-operative activity. In the winter of 1922-23 the Arctic Ice Cream Company of Detroit began replacing some of its ice cream cabinets with mechanically refrigerated cabinets. These had been developed by the Nizer Laboratories in co-operation with the Arctic company after several years had been spent in research work, designing and testing.

It is the practice in the ice cream industry, with very few exceptions, for the manufacturer to transport his product to the retailer, to furnish him with the necessary cabinets and containers, and with mixed ice and salt, often enough to keep the ice cream in good condition for serving. A manufacturer with a large number of "stops" necessarily requires a large fleet of trucks to deliver the ice cream and the ice and salt for servicing. Ice cream manufacturers produce their own ice, and crush and deliver it. At each stop the crushed ice must be mixed with salt, carried into the store and poured and pounded into the cabinets. In hot weather the shrinkage is enormous. The fountains in the retail stores are so constructed that the ice delivered by the ice cream manufacturer also cools drinking water, soft drinks and furnishes the cracked ice for glasses. The production and delivery of ice for servicing cabinets is

therefore a large element in the cost of ice cream. Crushed ice is used to the amount of 40 to 50 lb. per gallon of ice cream sold, and in many cases the consumption is much higher. In one of our largest cities an ice cream manufacturer, becoming impatient with the large ice consumption of a certain retailer, talked with him and pointed out the high cost of ice delivery. The ice consumption, however, did not decrease. Again the manufacturer went to his customer and offered him the ice cream for nothing if he would pay prevailing prices for delivered ice. The retailer agreed, but soon found he had made a bad bargain. In the end a competitor got the "stop."

The largest creamery in Detroit has manufactured more than 28,000 gal. of ice cream in one day. This creamery has a 300-ton ice plant. When it is realized that a large creamery will have from 2,000 to 3,000 "stops," some idea may be gained of the size and cost of this job of servicing and it is not surprising that the creameries can furnish mechanically refrigerated cabinets, maintain them and pay all operating costs and still save much over the old method.

ADDITIONAL PROFITS FOR ICE CREAM RETAILER

However, it is not only the manufacturer who gains from electrified ice cream cabinets. When the Arctic company began to install cabinets, the retailer soon found an increase in trade. Incidental to the pouring and pounding of the ice-salt mixture into his fountain was the mess and muss of drip from the door to the fountain and on the floor back of the counter. The store with mechanically refrigerated cabinets soon had some increase in trade due to greater cleanliness, better quality of product and the novelty of the new method. With the old ice-and-salt method there had been a shrinkage of about 2 qt. in every 5-gal. can of ice cream, and at the same time a decrease in quality. Ice cream contains a considerable amount of air, just as whipped cream does. This gives to it a rich velvety texture that appeals to the appetite. Whipped cream is usually considered preferable to ordinary cream of the same richness, because it tastes richer. The only difference is the air that the former contains. Likewise, ice cream, in a poorly serviced cabinet where proper and steady temperature is not maintained, becomes de-aërated and shrinks, at the same time leaving a hard, brittle product that does not melt readily when held in the mouth and is therefore less palatable.

Hence, with cleanliness in his store, an increase in his business and a 10 per cent saving in product, the Arctic company's distributor was well pleased, and told his neighbors. The result was a general demand by all retailers asking their manufacturers to provide refrigerated cabinets.

SOME OF THE PROBLEMS TO BE SOLVED

All the creameries, however, were not ready to provide cabinets and for good reasons they preferred to postpone their general adoption for a while. They had large investments in ice-making and ice-handling machinery, much of which would become obsolete by the general use of cabinets. In addition to abandoning good equipment, they would be required to spend hundreds of thousands of dollars for cabinets. The cabinet was a new idea, being tried for the first time in history. The small domestic refrigerator has not yet proved itself to the satisfaction of all. Then, too, there was the continued necessity for ice delivery for fountain use.

AVERAGE MONTHLY KILOWATT-HOUR CONSUMPTION OF ELECTRICALLY OPERATED ICE CREAM CABINETS

Month	Average Kw.-Hr.	Average Outdoor Temperature	Month	Average Kw.-Hr.	Average Outdoor Temperature
January	35.4	22.0	August	66.0	71.0
February	35.7	26.0	September	57.1	59.0
March	36.5	34.0	October	50.2	57.0
April	29.0	46.0	November	43.3	40.0
May	26.9	52.0	December	36.4	23.0
June	43.8	66.0			
July	54.7	70.0	Total	517.0	

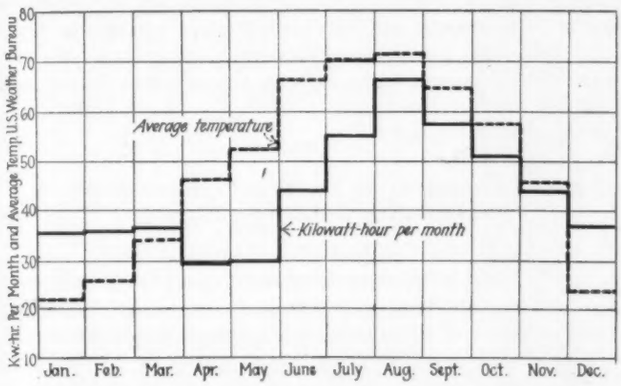
Data secured from records on fifty locations. A few locations have more than one cabinet.

Should cabinets be furnished by the ice-cream producer? Should not the retailer refrigerate his own fountain and have a reduction in cost per gallon of ice cream to compensate him? Naturally the producers hesitated spending one-half to three-quarters of a million dollars or more until these questions were settled. However, customers were demanding refrigerated cabinets. The ice cream industry is highly competitive and those manufacturers that did not furnish cabinets realized they were in danger of losing customers to the one that did, so they all got busy. Some bought Nizer cabinets, some designed and built their own. These electrically refrigerated cabinets began coming on our lines in rapid succession until at the end of 1923 we had about 500.

The refrigerating machine in an ice cream cabinet is driven by a ¼-hp. motor with an input of approximately 300 watts. Inasmuch as the creameries were to pay the bills, they requested the power company to install separate meters, but we believed the small load would hardly warrant a separate meter where the store already had one for lighting. This small load could go on the store lighting at a lower rate than the open-order power rate we would charge the creamery. A number of record meters could establish the allowance to the store for cabinet operation. This latter method was tried out for a time, but the creameries had so many complaints and so much difficulty in explaining why the cabinet was not responsible for large lighting bills that finally we were prevailed upon to install meters on nearly all jobs. We agreed to do this, however, only until the spring of 1925. The first of this year found us with more than 2,000 meters on these small accounts and six to ten orders coming in each day. We talked the situation over with the creamery people and finally notified them that further installations would have to go on the store meters and that we wished to begin removing existing meters. We received hearty co-operation in this. The creameries decided that the retailers should pay the bills. At first there was some protest, but the creameries pointed out the saving in shrinkage, which would more than pay the cost of electricity. At this time these special meters are nearly all removed.

The ice cream cabinets in Detroit and vicinity are manufactured chiefly by the Nizer Corporation of Detroit and the Frigidaire Corporation of Dayton, Ohio. They are sold wholesale to the creameries, which have their own trained crews for installing and servicing. The complete installations, including wiring and water connections, are the expense of the creameries, which have their own licensed electricians and plumbers. The cabinets, installed, cost the creameries $450 to $500, and a large creamery will have 2,000 to 3,000 retailers, many of whom will require more than one cabinet.

Ice cream manufacturers are quite generally convinced of the practicability and economy of mechanically refrigerated cabinets and fountains and would no doubt install cabinets at once if doing so could relieve them of the delivery of ice and salt. However, most of the fountains now in use are still dependent on ice and salt, and though cabinets are made to fit neatly behind the counter, there remains the problem of cooling soft drinks, water, etc., and the creamery continues to give this service even where cabinets are installed. Furthermore, refrigerated cabinets are not furnished the very small dealers, and of course ice and salt are again required. However, nearly all fountains now being manufactured are equipped for mechanical refrigeration and the cabinet builders are commencing to build refrigerated fountains that include a cabinet and means for cooling soft drinks and water, and making a small amount of ice. It is probable that the development will be toward refrigerated fountains owned by the retailers, though of course cabinets will still be provided for storage purposes. To all retailers providing their own refrigerated equipment and taking all responsibility for the delivered product, the ice cream manufacturers will be able to give a gallonage discount. One creamery in Detroit is now allowing eight cents per gallon under such conditions. A large number of refrigerated fountains will require considerably more than ¼ hp. A large store in Detroit is now changing its fountain from iced to mechanically equipped refrigeration. Eleven small units are being installed by the Frigidaire company with ½-hp. motors on each. This, of course, is an unusually large store.



GRAPH SHOWING ENERGY CONSUMPTION VARIATION WITH SEASONAL TEMPERATURE CHANGES

BALANCING THE COST AND SAVING

Regardless of "dual service," creameries that have furnished ice cream cabinets are making a saving. Interest, depreciation and servicing are totaling about 33 per cent to 35 per cent of the first cost. Servicing is averaging from $30 to $33 per cabinet-year. Depreciation is being figured at 15 per cent to 20 per cent, although the manufacturers claim that 10 per cent is ample. These costs are probably high, since they are based on experience and figures obtained when installers and service men were learning their jobs.

Obviously, with the number of variables encountered, it is difficult to arrive at the actual saving. Most creameries, however, admit a good profit on the investment in spite of dual service, machinery made obsolete and high allowances for depreciation and servicing. Some figures as high as 35 per cent saving on delivery costs are given, returning the investment of the creamery in three years. Where the cabinets are owned by the retailer, the savings are practically the same.

EFFECT ON GROSS AND NET ENERGY SALES

Records on fifty locations that had been in operation for a year show an average consumption of 517 kw.-hr. per year. Fifty locations do not necessarily mean fifty cabinets. In a few locations there are two cabinets. Some installations are equipped with a pump to circulate the cold brine from the cabinet through the fountain, the pump being on a separate motor. In such cases, energy consumption is, of course, above the average. The 3,500 locations now served in Detroit would therefore require a consumption of about 1,809,500 kw.-hr. per year. This is not all net gain to the power company, as it must be remembered that there is a large decrease in energy consumption at the creameries where we had been selling about 45 kw.-hr. per ton of ice made. Unless this machinery continues in operation and the ice is used for other purposes or sold to hucksters, the gain in kilowatt-hour output is not great.

COMPLETE ELECTRIFICATION ON THE WAY

Eventually the whole ice cream industry, including delivery trucks as well as cabinets and fountains, will be refrigerated. The small refrigerator is a recognized success and creameries will replace old or wornout equipment with machines. New equipment will be mechanically refrigerated. The central station can expect from ¼ hp. to ½ hp. and in some cases more power load at every location where ice cream is sold. Creameries that are not now installing cabinets are hesitating about the investment required, or because they prefer to let the retailer furnish a mechanically equipped fountain in return for a gallonage reduction in the wholesale price. Although the creameries are, in general, sold on the value of the new method of refrigeration, many of them feel, and justly, that the retailer should provide his own refrigeration. It would seem that the people to sell mechanically refrigerated cabinets to are the owners of confectionery and drug stores. However, if one creamery in a community adopts mechanically refrigerated cabinets, the other producers will be compelled to follow suit.

Electrical Progress in Rumania

ACCORDING to a recently issued report, there were 133 central electricity stations in operation in Rumania at the end of 1924, of which 29 are operated by water power, 62 by internal-combustion engines and the remainder by steam. In 73 of the stations direct current is produced, single-phase alternating current at four plants, two-phase alternating current at two stations and three-phase alternating current at 48 stations, no information being available as regards six of the plants. The largest stations in new Rumania are shown at Anina (steam), with an annual output of 19,000,000 kw.-hr. and a capacity of 7,110 kw.; the Arad station (steam), with a capacity of 4,000 kw. and a yearly output of 7,500,000 kw.-hr. and the Klausenberg station (steam, internal-combustion engine and water power) with a capacity of 3,200 kw. and an annual output of 10,000,000 kw.-hr.

Letters from Our Readers

Allocation of Fixed Costs

To the Editor of the ELECTRICAL WORLD:

E. G. Craig, in a letter which appeared in the ELECTRICAL WORLD for March 27, questions the premises and conclusions of A. S. Knight and other writers in discussing the allocation of fixed costs because he and they have not specifically considered hydro-electric generating plants. It would seem that Mr. Craig overlooks the fact that two operations are involved in the allocation of fixed costs. One operation is the determination of what portion of not only fixed costs but of certain operating expenses are the costs to be allocated by peak demands, maximum demands, consumption or some combination thereof. The other is the determination of a method by which such costs, after they have been determined, are to be allocated to systems, classes or consumers. The writer believes much confusion would be avoided by the adoption of a term such as "capacity cost" to represent the cost which is to be allocated by peak demands, maximum demands, etc.

Mr. Knight's article, as the writer understands it, is a consideration of how to allocate capacity cost to systems, classes or consumers, and not the determination of the cost to be so allocated. Mr. Craig presents one way of dividing the fixed and operating costs of a hydro-electric plant between capacity and energy costs.

W. J. GREENE,
Rate Engineer.

Iowa Railway & Light Corporation,
Cedar Rapids, Iowa

Mr. Knight Defends His Theory of Fixed-Cost Allocation

To the Editor of the ELECTRICAL WORLD:

E. G. Craig in the ELECTRICAL WORLD of March 27 (page 663) questions the admission, in my article on allocating fixed costs, that the amount of production investment is determined by demand at time of station peak and states that this condition applies only to fuel-electric generating stations and not to hydro-electric stations. I am not particularly concerned whether or not this is the case, as I made this statement in connection with the theory that fixed costs should be allocated on the basis of demands at time of station peak, which I disputed, and not in connection with my own theory, which was opposed to this view. It is, of course, true of steam stations only in a broad sense, since investment is also affected by other factors, such as the ratio of reserve capacity, which may vary in different steam stations, the efficiency at which stations are designed to operate, etc. From my standpoint it did not seem necessary to attach these qualifications to the statement referred to.

Mr. Craig's suggestion of charging to energy costs the fixed costs in excess of those at which a lower-cost peak-carrying plant could have been installed does not appeal to me as satisfactory or logical. It is apparently based on his premise that "if the investment in plant were made for the sole purpose of meeting the system peak," etc., which is an assumption which my theory denies, but which is more or less necessary to the advocates of the method of allocating on demands occurring at peak time. Production plant is needed not only at peak time but at all times, and investment in plant capacity, for whatever purpose it may have been made, is, I believe, more equitably allocated on the basis of aggregate customers' demands (regardless of the time when they occur) than by any other method, and I believe that this principle should be applied to hydro-electric as well as to steam stations. Actual carrying costs per kilowatt, which may have been increased for many reasons, are, under this plan, averaged over the entire business, the price per kilowatt of customers' demands decreasing with increasing business and increasing diversity of use among the customers added. Increased investment costs made to secure greater efficiency of steam stations of high load factor should not be charged to energy costs, as Mr. Craig's method would imply, because the high load factor of the generating station is not the result of serving high-load-factor customers alone, but comes from the union of many different kinds of business, resulting in high diversity factor.

Applying Mr. Craig's suggestion to hydro-electric plants would conceal the difference between the comparative investments and the comparative operating costs of steam and hydro-electric plants, which are in fact very different, and to be logical, a cost allocation should properly reflect the facts.

A. S. KNIGHT.

Boston, Mass.

User's Comment on Starting Compensators for Use with Induction Motors

To the Editor of the ELECTRICAL WORLD:

I have read with considerable interest the arguments relative to starting compensators used on induction motors in view of my fourteen years' experience with these motors ranging from 0.05 hp. up to 150 hp. and synchronous motors of larger sizes with voltages of 110, 220, 440 and 2,200.

The attitude of the power company serving the locality will to a great extent govern one's actions. We purchase power on our different properties from several different power companies. One company prefers that all motors of 50 hp. and over shall be of the slip-ring type on account of their starting characteristics. Another company will allow a partly loaded synchronous motor of 500 hp. and 2,200-volt rating to be started as an induction motor with a compensator. This bumps the line rather hard. The other company demands a compensator on anything over 5 hp. We have successfully started 25-hp., 2,200-volt motors and 50-hp., 220-volt motors by throwing them directly across the line.

Starting compensators are not a source of expense and trouble if properly designed and applied and are no more trouble to maintain than an induction motor. Some compensators of well-known makes will give much less bother and expense if slightly altered in construction. The writer found upon taking charge of one installation that a certain type of compensator was giving considerable trouble. Six weeks was the longest one had ever operated without a shutdown. A careful study of conditions revealed the cause of the difficulty, and after this was remedied these compensators gave an average of 26 months of service. They operated about 313 days per year, giving approximately ten starts per day before requiring any expenditures, except for periodical inspection.

HERBERT H. VAN KEUREN,
Chief Electrician.

Cleveland Stone Company,
Cleveland, Ohio.

Central Station and Industrial Practice

Circuit Breaker Oil Drying by Inductive Heating

By H. C. Louis
Chief of Research and Test
Consolidated Gas, Electric Light & Power Company of Baltimore

MOISTURE, even in very small quantities, seriously decreases the insulating qualities of oil. It is therefore desirable to keep oil in oil switches as free from moisture as possible. This moisture may be produced by the action of the arc while the switch is operating; it may be absorbed from the atmosphere, or it may even come from other parts of the switch, which may contain small amounts of moisture. It is the aim in our stations to maintain the oil as free from moisture as possible. It is regularly tested and the necessary remedies applied.

The standard methods of replacing and refiltering oil have given doubtful results at times, moisture sometimes reappearing after short intervals. This can be caused by moisture absorption during handling of switch and drums. It can also be caused by the fact that all of the moisture has not been removed from the other parts such as liners, lift rods and metallic parts exposed above the oil.

Our transformer experience has greatly emphasized the fact that oil-immersed insulation may be a source of moisture, which can be driven out only by heating methods. Transformers can readily be heated by applying current to short-circuited windings. An oil switch could not be appreciably heated by currents carried through the normal current-carrying parts. Other heating methods could not be conveniently applied; besides, there is the objection of the attendant fire hazard.

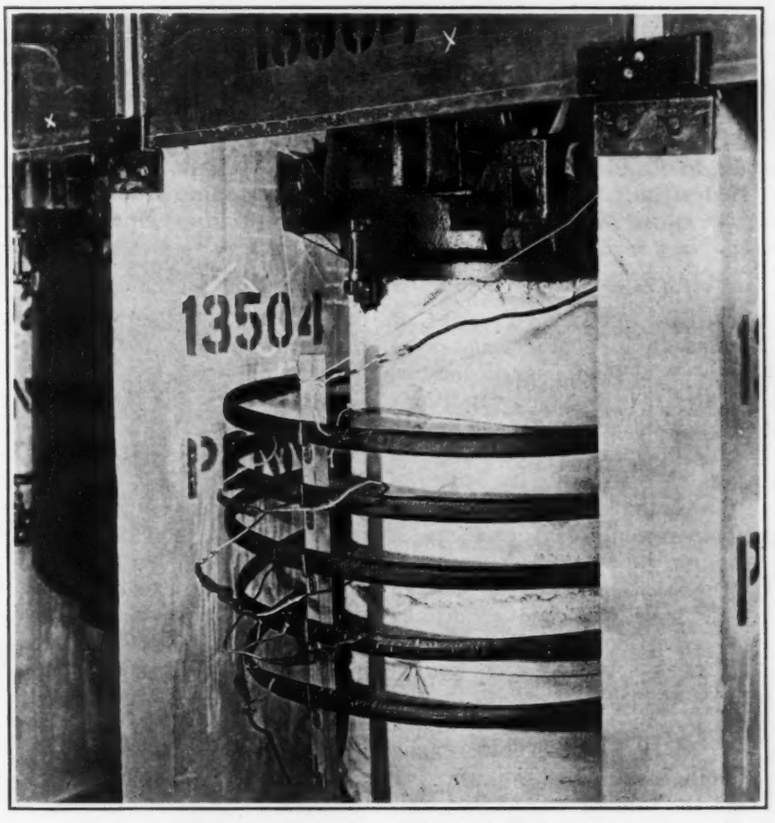
The induction method was therefore developed by us. One very great advantage of this method is that it thoroughly heats up all of the parts of the switch exposed to the oil, and thus drives moisture from these parts. For this reason we have found it desirable to dry out new installations, which have given us the greatest trouble from moisture. Even when electrical tests indicated no moisture in the oil, we found that, by heating, moisture was precipitated, proving its presence in other parts. It is this moisture that has given trouble in the past with new installations, causing repeated reappearance of moisture after refiltering. It is therefore good policy to dry out new oil switch installations as is done with other electrical apparatus.

Another difficulty in connection with treating oil in switches is the necessity of taking the switches out of service. With the induction method the equipment can be quickly set up and as quickly disconnected if the switch is suddenly needed. Furthermore, switches in different stations can be treated at the same time, so a minimum number of switches only must be tied up in a station.

The equipment is also much cheaper than other dehydrating devices. It requires fewer men to operate and handle than other equipments. These coils can be transported in a Ford, whereas filters and oil drums must be transported in trucks and require more handling and men.

Considerable thought was given to the development of a satisfactory heating coil. The first experiments were made with the winding around each tank in the form of a single continuous winding, which had to be done by hand, requiring several hours for each tank. A form-wound coil mounted on a cylindrical holder was then tried. Although this could be applied on and off the tank, this could be done only with difficulty on account of small clearances due to drain cocks, compartment walls and adjacent tanks.

We therefore conceived the idea of making up the winding for each tank in separate coils wound in the form of rings. Ample diameter



HEATING COILS IN PLACE AROUND OIL SWITCH TANK

enables these to clear obstructions and to be readily mounted. The different sections are connected in series after mounting. A further advantage of the ring form is that different types and sizes of switches can be taken care of by varying the number of coils used. The coils are form wound and can be made up cheaply in our shops. When once made up, they can be kept on hand, available for grouping in various combinations. The coils were at first held in place with cord. We later constructed a more convenient holder, made up of a wooden rod with metallic hooks. This also spaces the coils properly.

Some of the coil data are as follows:

Wire and size	No. 10 double cotton covered
Insulation	Cotton tape
Impregnation	G.E. No. 460
Turns per coil	25
Amperes	5 to 15
Volts	110-220
Frequency	25 to 60 cycles

The number and grouping of the coils used is varied to take care of frequency and voltage, and the switch tank size to give desired heating.

Oil temperatures of about 75 deg. C. have been used by us. Higher temperatures might be used, but previous experience with switch liners showed that temperatures of 90 deg. C. or above softened the binding material in some of these. The use of 75 deg. C. allows a good margin of safety.

Comparisons Between Lighted and Unlighted Highways

Headlight Road Illumination Not Sufficient for Timely Perception of Pedestrians, Obstructions, Curves and Changing Road Conditions When Car Is Moving at Usual Highway Speed

BY FRANK C. TAYLOR
Industrial Sales Department, Rochester Gas & Electric Company, Rochester, N. Y.

ON FEB. 17, 1926, a series of comparative photographs were taken on Chili Road, near Rochester, N. Y., in order to show conditions existing on an unlighted road and to show the comparative visibility on an illuminated road. In order to have the photographs give a true indication of conditions existing, a two-minute exposure was given to each one of the negatives and in order to have the road conditions similar a section of unlighted concrete road was taken which was as nearly similar as possible to the section of concrete road which was illuminated. In all the photographs the headlights of the car were on full and the camera was located outside of the car but adjacent to the window at the left of the driver.

The type of illumination consisted of General Electric radial wave reflectors with a 200-candlepower lamp on a short crane mounted approximately 18 ft. from the surface of the road. The lights are spaced 250 ft. apart on the same side of the road. Before making the test the standard headlights of the Dodge car used were tested in order to be certain that they were adjusted in accordance with the New York State law.

In the illustrations 1 and 2 a pedestrian was stationed on the side of the highway approximately 50 ft. ahead of the camera. These photographs show clearly that on the unlighted road the pedestrian is visible only as far as his knees, whereas on the lighted road the full figure is clearly visible.

In the second pair (3 and 4) it was desired to show the visibility of a car parked at the side of the road without lights. In both cases the car was visible 80 ft. from the camera.

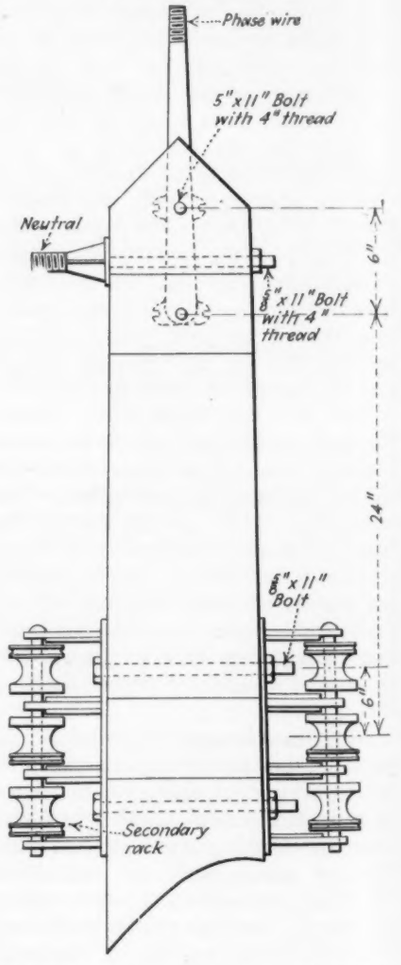
In the illustrations 5 and 6 a pedestrian was located 112 ft. from the camera. In this case on the unlighted road the pedestrian is absolutely invisible, whereas on the lighted road he can be clearly seen.

The distance in which a car should stop at different speeds when equipped with rear wheel brakes only as prepared by the United States Bureau of Standards, the A.E.S.C. and the A.A.A. are as follows: At 25 miles an hour, 78.2 ft.; at 30 miles an hour, 112.1 ft.; at 35 miles an hour, 153 ft.; at 40 miles an hour, 200 ft.

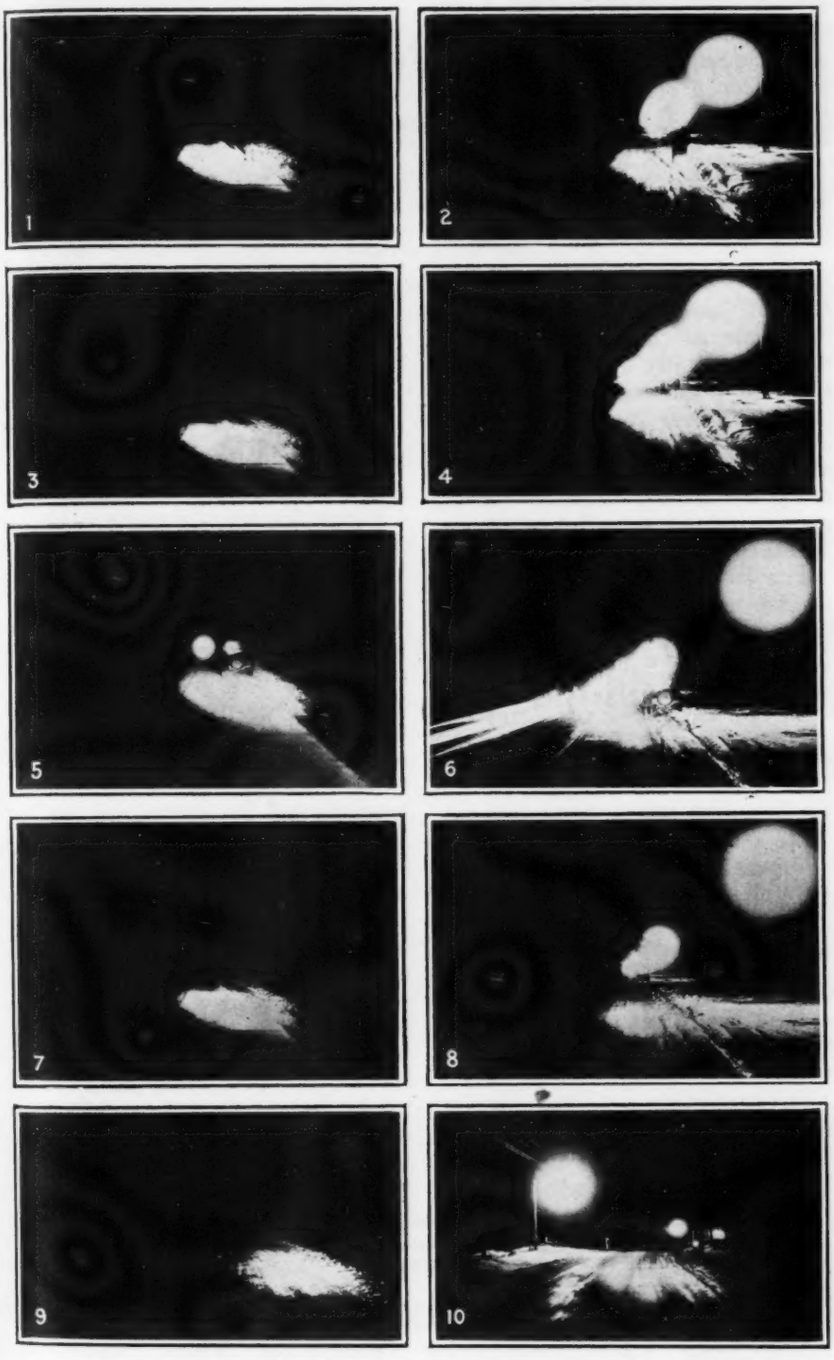
From a consideration of these figures we find that a car traveling 30 miles an hour can be stopped in 112 ft. Now if we look at the third series of photographs where the pedestrian was 112 ft. in front of the camera, it is obvious that if the car had been traveling 30 miles an hour the driver could not have stopped the car before reaching the pedestrian or an obstruction on the road, since in the photograph the pedestrian is not yet visible at 112 ft. These are perhaps the most important photographs of the series, since they show that it is really not safe to drive 30 miles an hour on an unlighted highway when the car is equipped with legal headlights of this particular make.

The fourth pair of views (7 and 8)

Primary Pole Top Construction



THE accompanying illustration shows the primary pole top and secondary rack construction used by the Union Electric Light & Power Company of St. Louis in residential districts served by single-phase lines. This construction has been standardized because of its neatness and economy. The neutral conductor is placed on the top insulator of the secondary rack in order to protect the secondary wires more effectively in case phase wires of higher voltage fall on them. The wire on the middle insulator is known as the top secondary side and is common with the north and west sides of secondaries mounted on crossarms when interconnected. Secondaries on the bottom insulators are common to the south and east sides of secondaries mounted on crossarms.



CARS EQUIPPED WITH LEGAL NEW YORK STATE HEADLIGHTS ON UNLIGHTED (LEFT) AND LIGHTED (RIGHT) HIGHWAYS

Road conditions in parallel illustrations are identical. Very poor visibility on unlighted road prevents safe driving at speeds considerably lower than legal limits

show what is visible 210 ft. ahead of the camera. The headlights of the car alone do not show the stalled car at the side of the road, but on the lighted road not only the stalled car but also the pedestrian is perfectly visible. It is obvious from these two photographs that on a lighted highway the driver has ample time in which to get his car under control, since in this case he can clearly see objects 210 ft. away. From a consideration of the A.A.A. table it is evident that on an unlighted road, as far as visibility is concerned, it is just as safe for a car to travel 40 miles an hour as it is for a car to be moving 30 miles an hour on an unlighted highway.

The last illustrations (9 and 10) give a comparison between lighted and unlighted curves. On the unlighted roadway when the curve is approximately 130 ft. from the car the headlights just begin to indicate that there might be a curve. On the other hand, on the lighted road the curve is very clearly visible and in fact the driver of the car is warned for a long distance ahead that he is approaching the curve, because he sees that the street lights no longer present a straight line effect but curve either to the right or the left.

A car going 30 miles an hour is traveling at the rate of 44 ft. a second. This means that the driver has three seconds from the time he first sees the curve, 130 ft. away on the unlighted highway, to either reduce his speed or get ready to make the curve. Three seconds is not very much time when it is considered that the driver of the car may not be giving the road his undivided attention and when it is further considered that the sharpness of the curve or the condition of the roadway may require a considerable reduction in speed.

In addition to the visibility indicated by the photographs of the illuminated road compared with the unlighted road there are several other advantages to be derived from adequate highway illumination. In the first place, various road signs, such as "Curve," "Stop," "Danger, R.R. Crossing," etc., are much more easily seen when there are highway lights than when the only illumination is from the headlights of the car. Holdups are discouraged, because darkness invites crime and light acts as a strong deterrent.

To the motorist in trouble necessitating repairs on the road great assistance is given by highway illumination. Further, there is an increase in real estate values when highways are illuminated, because one of the most obvious differences between the city and the country is the black darkness that surrounds the home and isolates one from one's neighbors.

In addition the capacity of the roads at night is materially increased, since cars may be driven with safety at least 30 miles an hour when the highways are illuminated. Without illumination the safe driving speed is decreased. If the main trunk highways were adequately illuminated night-time driving would be encouraged. In other words, in summer if there were sufficient highway illumination, motorists on trips would drive in the evening rather than during the heat of the middle of the day. In addition, night driving on short summer evening trips would be made much

more pleasant and safer, so that there would be less objection on the part of the driver to taking his car out.

Further, there would be more trucking at night. In this way the capacity of the highways would be increased and result in a material saving, since increase in road capacity would tend to postpone for a few years at least the building of additional trunk highways to take care of increased traffic.

Clevis Increases Conductor Clearance

IT IS standard practice of the Public Service Company of Colorado on its 90-kv. transmission lines to use a 12-in. clevis for attaching the insulator strings to the tower instead of suspending them in the usual manner. This method of construction is shown in the accompanying illustrations. The clevis is made of ¾-in. galvanized iron rod bent into the shape shown and increases the

TRANSMISSION LINE CONSTRUCTION USING LONG CLEVIS FOR ATTACHING INSULATOR STRINGS TO TOWER

conductor clearance from the tower by 1 ft. This additional length gives greater clearance between the conductor and tower on angles and is especially valuable on transposition towers to prevent reduced clearance.

It is the opinion of the engineers of the company that this method of construction would be preferable to dead-ends at railroad crossings, because if a conductor should break the insulator string would swing out into dead-end position, thereby increasing the sag and reducing the tension, so that standard towers could be employed. Substitution of a standard tower for a special crossing tower would effect a saving of $800 per tower.

Method of Obtaining and Use of Current Transformer Table

THE accompanying table was made so the line current and transformer size of an installation could be quickly computed when the load and power factor were known. The table indicates the line current and transformer size for three different power factors—namely, 100, 80, and 60 per cent—and nine different values of line voltages.

For example, the line current and transformer size on a 100-kw. installation at 440 volts, 80 per cent power factor for three phase, four wire, would be

Line current 1.64 × 100 = 164 amp.
Transformer size 4.36 × 100 = 436 amp., or 500/5.

The method of computing the values on the chart was as follows:

For three phase, three wire:
Line current = watts ÷ (volts × $\sqrt{3}$ × P.F.).
Transformer rating = line current ÷ 0.65.

The transformers are compensated at 65 per cent of the marked value, so the transformer should operate at this point the greater part of the time.

On three phase, four wire, the line current is the same as on three phase, three wire. The transformer size is $\sqrt{3}$ times as great as on three phase, three wire. This multiplying factor is used because the current transformers are connected delta and the current in each element of the two element meter is the vector sum of the current in two transformers on the $\sqrt{3}$ × line current. This prevents overloading of the meter element.

For two phase, three wire:
Line current = watts ÷ ($\sqrt{2}$ × volts × P.F.).
Transformer size = line current ÷ 0.65.

Electric Stereotype Metal Pot

SUBSTANTIAL economies and simplification of melting and casting followed the adoption of an electrically heated pot for melting stereotype metal in the new plant of the Waterbury *Republican American*, Waterbury, Conn.

The electric pot has a capacity of 5 tons and heat is furnished by nine General Electric cast-in heating elements of the sheath wire type, each rated 5 kw. at 220 volts. Accurate temperature is maintained at all times by means of an automatic control panel and a thermostat, with a sensitive bulb in a well in the pot.

A gas-heated pot, superseded by the electric melting pot, consumed approximately 131,000 cu.ft. of gas per month at a cost of $1 per 1,000 cu.ft., making a total of $131 per month for fuel. Against this, the electric pot uses an average of 8,000 kw.-hr. per month, costing at the rate of 1.25 cents per kilowatt-hour, or a total of $100 per month for electricity.

LINE CURRENTS AND CURRENT TRANSFORMER RATINGS PER KILOWATT FOR ALTERNATING-CURRENT CIRCUITS OF DIFFERENT VOLTAGES AND POWER FACTORS.

		Three Phase, Three Wire		Three Phase, Three Wire		Two Phase, Three Wire		One Phase	
Line Volts	Power Factor Per Cent	Line Current	Transformer Rating	Line Current	Transformer Rating	Line Current	Transformer Rating	Line Current	Transformer Rating
110	100	5.25	8.08	5.25	13.99	6.43	9.89	9.09	13.99
	80	6.56	10.11	6.56	17.46	8.04	12.37	11.37	17.46
	60	8.75	13.47	8.75	23.29	10.72	16.49	15.15	23.29
220	100	2.63	4.04	2.63	7.00	3.22	4.95	4.55	7.00
	80	3.28	5.05	3.28	8.75	4.02	6.19	5.68	8.75
	60	4.38	6.74	4.38	11.66	5.36	8.26	7.58	11.66
440	100	1.31	2.02	1.31	3.49	1.61	2.48	2.27	3.49
	80	1.64	2.53	1.64	4.36	2.01	3.10	2.84	4.36
	60	2.19	3.37	2.19	5.81	2.68	4.13	3.79	5.81
2,300	100	.251	.387	.251	.668	.308	.474	.435	6.68
	80	.314	.483	.314	.835	.384	.592	.544	.835
	60	.418	.644	.418	1.11	.513	.790	.725	1.11
4,500	100	.128	.197	.128	.341	.157	.242	.222	.341
	80	.160	.246	.160	.426	.197	.302	.278	.428
	60	.213	.328	.213	.568	.262	.403	.370	.568
6,600	100	.088	.135	.088	.234	.107	.165	.152	.234
	80	.110	.168	.110	.293	.134	.206	.189	.293
	60	.147	.226	.147	.390	.179	.274	.253	.390
13,200	100	.044	.068	.044	.117	.054	.083	.076	.117
	80	.055	.085	.055	.146	.068	.104	.095	.146
	60	.073	.112	.073	.195	.09	.138	.126	.195
33,000	100	.017	.026	.017	.045	.021	.032	.030	.045
	80	.022	.034	.022	.057	.027	.040	.038	.057
	60	.029	.045	.029	.075	.036	.054	.051	.075
66,000	100	.009	.014	.009	.024	.011	.017	.015	.024
	80	.011	.017	.011	.030	.013	.021	.019	.030
	60	.015	.023	.015	.040	.018	.028	.025	.040

Commercial Activities and Public Relations

T. F. Kennedy Shows Need for Greater Sales Activity

WARNING utility companies that they are in danger of losing some of their business through competition from other forms of power, Thomas F. Kennedy, head of the new-business departments of Henry L. Doherty & Company, speaking before the Middle West Division of the N.E.L.A. at Des Moines, Iowa, last week, called attention to changing conditions that will make necessary greater selling effort by central-station companies.

"Your accomplishments to date make a wonderful and inspiring picture," he told the members, "but they are history. Work done is only useful as a spur for work begun," he added, declaring that the job ahead was the development of sales organizations, one function that electric utilities as a whole had largely neglected.

Without a well-trained sales organization, asserted Mr. Kennedy, no modern industry can create, hold and build up the market or demand for its product. He went on:

"There are two outstanding reasons usually given to show why sales departments should be started or enlarged—first, to correct poor power factor or load conditions and, second, to build up sales by adding new customers. It has been proved time and again that exploitation of appliances and apparatus will do both. A third reason, protection or insurance of present business, is now beginning to equal the others in importance.

"I do not believe that there are many who realize the extent and power of certain interests and forces which are threatening our present revenues. Already they have taken some of our business and are preparing to get more of it. In my opinion, I do not believe that our industry is properly prepared to resist these attacks.

"For illustration, the laundries, using door-to-door men advertising with clever appeals, have increased their business 500 per cent in five years. The gross sales of corporate laundries alone, not including wet-wash companies, Chinese or the washerwoman, exceeded $500,000,000 in 1923. Each dollar of their increase means ironing, lighting and washing machine revenue lost to our industry.

"Baking now is seventh in the country's great industries. In 1914, 75 per cent of all bread was baked in the home; today less than 24 per cent is baked by the housewife. The corporate bakers report the huge total of $1,250,000,000 worth of business for 1925. We all know their door-to-door methods.

"The domestic field is not the only one attacked. Steam-engine manufacturing concerns with an improved product are going after your power business with alarming success. Many electric companies have been rudely jolted receiving 'disconnect' notices from large power customers conveying the information that the latter are substituting for central-station service electric power generated by steam plants of their own.

"One of the steam-engine concerns in particular is making proposals to manufacturers, especially those in need of process steam, which they cannot reject. The Diesel-engine competition, too, will bear watching in manufacturing plants now using central-station power, where little or no steam is required."

Merchandising Co-operation with Dealers

Boston Edison's New Plan Designed to Facilitate More Active Sales Efforts and Quicker Profits to Dealers in Local Electrical Field

FOR SOME time the Edison Electric Illuminating Company of Boston, Mass., has been studying the electrical appliance market in its 700 square miles of territory, with the object of stimulating greater sales activity and developing a wider co-operation among dealers engaged in electrical merchandising and encouraging potential successful sellers in this field. Central-station merchandising departments in this general region have been holding their own, but of late the competition of the department store has become acute to the electrical dealer, and electric specialty companies and manufacturers selling goods direct have also taken business from him. Business depression following the war discouraged appliance selling by many contractor-dealers; radio led many away from the usual socket devices, and not a few contractors have dropped by the wayside so far as appliance sales are concerned. A new plan of sales co-operation has therefore been developed by C. Ernest Greenwood, superintendent of the appliance department, and an immediate improvement in the merchandising situation has begun to be evident.

Lack of interest in appliance merchandising was frequently found in the company's survey of field conditions, and the absence of enthusiasm was found to be due to three main causes: (1) Lack of capital to carry on merchandising; (2) lack of organization to create sales or to follow prospective customers for appliances in the demonstration class after the business has been created; (3) inadequate credit standing to enable the stocking of appliances under standard purchasing practice and to arrange for financing deferred payments.

Under the general merchandising policy of the company, Edison customers may purchase appliances direct from the company or through dealers in its territory. In the new plan the company offers the dealer two methods through which he may supply his customer's needs. The first is a direct purchase plan under which the dealer may buy the article direct from the company after completing a sale, at a price that will enable him to reap a good profit. The second plan is a commission arrangement under which the company pays the dealer for a legitimate "lead" resulting in a completed sale. The company offers these plans because it realizes it is not always to the dealer's advantage to handle all appliances having a guarantee of durability by the manufacturer, and that the dealer needs aid in the demonstration, servicing and financing of such appliances.

It is the company's policy to sell at list prices all appliances where "list" is the selling price as understood by the manufacturer. The only exceptions are "specials" or cases of overstocks, and these are sold at prices commensurate with sound merchandising practice. Co-operating dealers are expected to follow a like policy.

DIRECT PURCHASE PLAN

Any electrical dealer who has a fixed store location and who is in good standing with his community may purchase direct from the Edison company any appliance that it sells, provided he fills an order for the appliance from an Edison service customer. The dealer may buy singly or in quantity, and the purchase price will be as low as good ethics and good business will permit. It is not the company's purpose to do a jobbing business, and the company expects that articles bought by dealers on this direct purchase plan will be confined to appliances that have no standard list or to appliances that the dealer may wish to buy in less than standard package quantity.

On articles having no standard "list," or in other words, "specials," the company offers the dealer the benefit of its larger purchasing power so that he can offer his customers the same article the company may be aggressively promoting.

SCHEDULE OF COMMISSIONS
(MARCH 1, 1926)
Subject to change without notice

Washing Machines:	
Easy Vacuum, Thor Cylinder, Savage Centrifugal	....15 per cent of list
Thor Oscillator	..10 per cent of selling price
Vacuum Cleaners:	
Duplex Premier, Eureka Vacuum, Hoover Brush	....10 per cent of list
Beacon Suction	..10 per cent of selling price
Electric Refrigerators:	
Kelvinator, Frigidaire, Servel	..10 per cent of list f.o.b. factory
Electric Ranges:	
Hotpoint, Universal, Simplex, Crawford, Westinghouse	..5 per cent of Boston Edison sales price
Electric Sewing Machines:	
Free Westinghouse	....10 per cent of Boston Edison sales price
Miscellaneous Devices	...To be announced at time of sale

COMMISSION PLAN

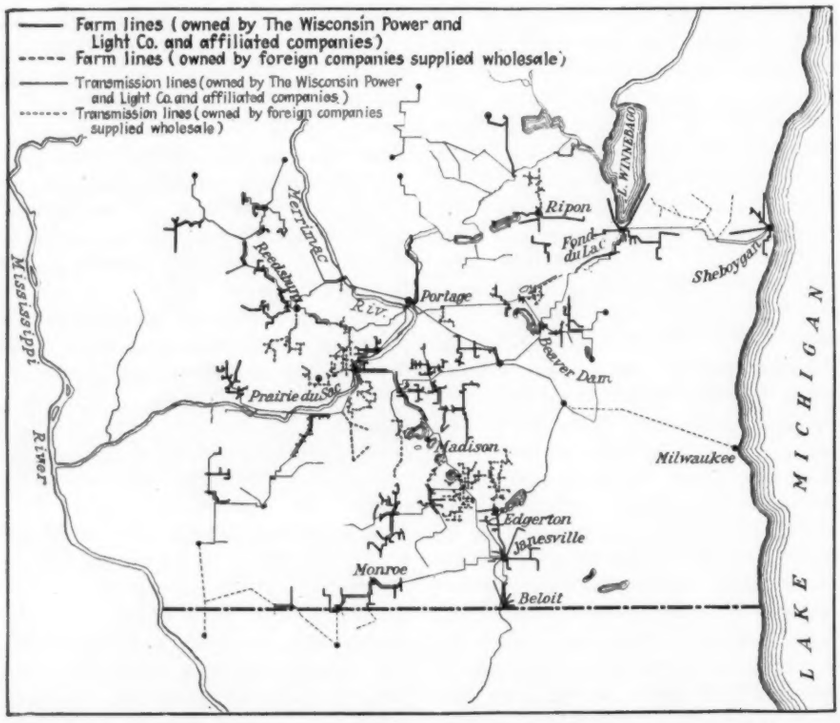
Under the commission plan the company offers the electrical dealer a method by which it can aid him in the demonstration, servicing and financing of electrical devices selling above $30. The company realizes that the employees of the contractor-dealers are in constant contact with electric service customers and that many "leads" and sales can be secured through them. Therefore under this plan the company will ship, finance and service the appliance for the dealer and pay the commissions detailed in the accompanying table.

The plan was first offered to members of the Metropolitan Electrical League of Boston, and in the first month of its operation more than a score of electrical dealers took advantage of it. This was the result of direct contact, and a printed copy of the plan has now been mailed to dealers of standing throughout the Edison territory.

Before advertising a special sale the company sends an announcement to dealers so that they can be informed of the company's action and be ready to tie in if desired. Thus, before the company's annual sale of a high-priced iron on deferred payments, which is "special" for it on a small device, the dealer was informed that an Edison customer wishing to purchase one of these irons through him might do so, and if the dealer did not wish to give deferred payments, the company would receive the order from the dealer by telephone or otherwise and would then ship, finance and service the article, paying the dealer $1.55, which would represent his full net profit on the transaction were he selling the iron direct.

At present the company is tying in with National Toaster Month by a four-cornered arrangement with the toaster manufacturer, a baking concern and a newspaper. Any dealer can accept "wrappers" and the company will pay him a commission. The foregoing two examples are instances of what are referred to as "Miscellaneous Devices" under the schedule of commissions to be announced at the time of sale. The company recently started the sale of a leader in a washing machine and a new vacuum cleaner for a leader in that line, giving the

Farm Service Activity in Wisconsin



SOME measure of the extent to which the Wisconsin Power & Light Company and affiliated companies in Wisconsin have gone already in supplying electric service to farmers is indicated by the above map. This map shows only the farm lines owned on Jan. 4, 1926, by the Wisconsin Power & Light Company and affiliated companies, and farm lines owned by foreign companies supplied wholesale, the transmission lines of these companies being subordinated to emphasize the rural lines. Other indications of the activities of the Wisconsin Power & Light Company in this direction have been reported before, such as a special department in charge of studying protection and promoting this business, method of financing and form of contract. G. C. Neff is vice-president and general manager of the company.

dealers previous written announcement.

If any dealer wishes the company to finance a sale from his direct stock, he uses a special dealer lease form (along the Morris Plan line) for sales on appliances selling for more than $30 and which are carried by the Edison appliance department. A charge of 2 per cent is made for this service.

District Managers' Meetings That Get Results

THE Southern Division of the Illinois Power & Light Corporation finds it helpful to call its district and local managers together at headquarters in St. Louis at variable intervals to discuss company problems. Many meetings of this kind are failures because the division officials direct the meetings and the managers do not get a chance to discuss points that they wish to have cleared up. In many cases such discussion as there is becomes disjointed and of doubtful value. These meetings, therefore, were carefully planned so that full advantage would be taken of all the time available and all questions would be thoroughly discussed.

Managers usually assemble at the division office Monday noon and in most cases the meetings last until Tuesday night. During the first afternoon no division officials are present and the managers elect their own chairman and bring up the questions they want discussed. One man is delegated to present each question, and any others who have opinions on it boil them down and prepare them for clear and brief presentation. The next morning these questions are brought up in order with division officials present, opinions are given by managers and the division officials and an agreement as to the best practice in the case involved is reached. A lack of problems to be discussed has not been found, as the field men are encouraged to put them forward.

In the afternoon the division manager presents any company policies which he deems necessary, makes comments on operating problems and discusses plans for the future. Meetings conducted in this way have been very successful. They have saved time, prevented unnecessary discussion and have brought about clearer understanding between field managers and the central office.

Some Advantages of

Industrial Electric Heating

It makes a uniform product. It requires less floor space.

It reduces cost of preparing and machining product after heat-treatment.

It provides a uniform temperature.

It reduces variations in tensile and ductile qualities of metals.

It makes heating possible in a vacuum at relatively low temperature.

It improves the product. It is easily controlled.

It requires less space for containers in oven or furnace.

It lowers the temperature of operating rooms.

It has great possibilities in the bright annealing of copper.

It permits maximum temperature of any part of furnace only slightly above that of heated material.

It reduces the number of rejections.

It minimizes noise. It reduces breakage.

It reduces smoke and makes healthier operating conditions.

It frees less volatiles from low melting temperature metals in alloys.

These statements are a consensus of opinions expressed at a conference on industrial electric heating lately held at Purdue University at which representatives of about 150 Indiana and Illinois industries were present.

Post Cards Speed Change of Address

MOVING time in every city always creates a peak load upon the meter department of the central-station company. In Erie, Pa., this season comes on the first days of March and April. To facilitate the installation of service in new locations where customers are moving, the Erie Lighting Company during February and March sends circulars with a stamped return post card to all residential consumers asking for their co-operation in case they are changing their address.

The circular sets forth the advantages of electric service and how the company is equipped to take care of a customer's wants. The post card shown here is to be filled in by the customer who intends to move. Space is provided for the customer's name, present address, new location and date service will be required at the new address. With this information the Erie Lighting Company is able to establish service when or before the customer moves in.

To our Patrons:

If you intend to move this spring your electric company would appreciate advice regarding the change contemplated. It will enable us to care for the requirements at your new home in a more prompt and satisfactory manner. There is no charge to change your service.

Please fill in and return

Name.....

Present Address.....

New Address.....

Date Service will be required at our new address.....

RETURN POST CARD USED BY CUSTOMERS CHANGING THEIR ADDRESS

Digest of Electrical Literature

Transmission, Substations and Distribution

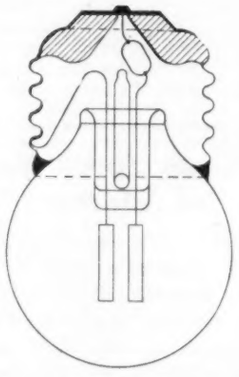
Single-Core Armored Cable for Alternating Currents.—W. CRAMP.—If around a cylindrical conductor carrying an alternating current a spiral of highly permeable material is wound, this material will carry a magnetic flux far greater than the merely circumferential component. The flux will depend on the lay and pitch radius of the spiral as well as upon the current in the cylinder. According to this theory, which gives results that check with laboratory tests, the magnetizing force acting along one complete turn is $H = 0.4\ \pi\ I/l_1$, where I is the current in amperes and l_1 is the length of one turn of the spiral. If a second spiral is wound over the first in the reverse direction, the circumferential components add up, but the longitudinal components neutralize one another. The circumferential components determine the inductance of the cable; the opposing longitudinal components, while not affecting the inductance, may, however, flow in local magnetic circuits and thus add to the iron losses. Based on this reasoning, computations were made for a 37/0.092 cable, 1.37 in. in diameter under the armor, rated at 214 amp., armored with 50 wires each 0.08 in. in diameter and having a spiral pitch of 14.25 in., and on a similar cable, but double-armored. The computed reactance voltage at 50 cycles for the former was 14.2 and for the other 27.5, which agreed closely with measured voltages of 15.6 and 29.2. Similarly, fairly close checks were obtained for the iron losses, computed separately as hysteresis and eddy-current losses. Now, for extra-high-tension circuits single-core cables can more readily be built than multiple-conductor cables, and the author's studies indicate that even with double armor the iron losses need not exceed 30 per cent of the copper losses in a cable designed for 132,000 volts.—World Power, February, 1926.

Circuit Constants in Transmission-Line Calculations.—A. C. A. CALDWELL.—In this paper formulas for calculating the constants of series and parallel circuits are developed, and the determination of the particular constants for transmission lines and for transformers is dealt with in detail. Methods of dealing with more complex cases are then taken up, such as lines supplying more than one substation and branching lines.—*Journal of I.E.E. (British)*, February, 1926.

Technical Details Concerning Glass of Vacuum Tubes.—K. NORDEN.—Modern developments in vacuum tubes have brought unusually high peak values for both voltage and current. There are available valve tubes for as high as 239 kv. and rectifier tubes for several hundred amperes. Apparatus of this type calls for highly skilled technical experience concerning glass and details of this kind are given in the paper under notice. A noteworthy example is a bulb for a 100-kw. (250 amp. at 440 volts), six-phase mercury-arc rectifier made of high-melting-point Jena glass. Molybdenum is used for all lead-wires. A bulb of this class has to dissipate heat losses of 4 kw. to 5 kw. To reduce breakage in shipment of such bulky glass apparatus, special packing methods have been devised, providing a resilient spring suspension within wooden crates.—*Elektrotechnische Zeitschrift*, Feb. 25, 1926.

Illumination

Recent Developments of Moore Gaseous Conductor Lamps.—D. MCFARLAN MOORE and L. C. PORTER.—For some years past the smallest-wattage 110-volt incandescent lamp ordinarily used has been the 10-watt size. The gap between this size and zero can be filled in with gaseous conductor lamps, of which a new form is described. Some of these require only 0.01 watt. One type is shown in the figure. The glow is due to corona, the electrodes becoming luminous alternately in successive half



NEW FORM OF GASEOUS CONDUCTOR LAMP

cycles. In this particular case the bulb is spherical, 1¼ in. in diameter, and is provided with a medium screw base. The two straight wire electrodes are of pure magnesium, 0.090 in. in diameter and $\frac{7}{16}$ in. long. They are welded to the nickel lead-in wires, the parallel gap between them being about $\frac{1}{32}$ in. After the bulb is thoroughly exhausted it is charged to 30 mm. with a gas prepared from commercial neon and composed principally of neon and helium. Because the resistance decreases with increasing current, a series resistance of 15,000 ohms is used, placed in the base. On alternating current, as the potential is gradually increased the first faint luminosity appears at 80 volts, with 0.00002 amp. flowing. At 90 volts, with 0.00018 amp., there is full corona. Above this the current increase is proportional to the voltage, and at 142 volts the current is 0.0033 amp. A number of other types have been developed. The behavior on direct current is interesting. If one of these corona lamps is connected in series with a resistance of several hundred thousand ohms and in parallel with a condenser, bright flashes occur at definite intervals, the frequency of which may be varied from many thousands per second to one flash in about five minutes. This property has been used in the transmission of photographs. Since there is nothing corresponding to the time lag of the incandescent lamp, due to the heating or cooling of the filament, the response to the application or cutting off of voltage is instantaneous. Suggested applications for the new lamps are their use as indicators to show the location of switches in the dark, to show when current is on in an appliance, to enable door numbers to be read and to give a feeble all-night illumination in houses, as a signal or for flashing on signs (with battery and condenser), and for seeing a distant scene or action by means of electrical impulses.—*Transactions of I.E.S.*, February, 1926.

Units, Measurements and Instruments

Resistance Thermometers.—J. VASSILIÈRE-ARLHAC.—Temperature measurements based upon the almost linear change of ohmic resistance of metals with changing temperature are used today very extensively because they provide simple and sufficiently accurate results. The paper gives formulas for such thermometers and describes a number of methods that have been found most suitable. Among these are bridge methods for direct-current and alternating-current supply, a double moving-coil instrument and a compensation connection. A valuable addition to the paper is a chapter on the magnitude of errors inherent in the various methods described.—*Revue Générale de l'Electricité*, Feb. 27, 1926.

Properties and Testing of Magnetic Materials—XII.—T. SPOONER.—In this installment the effect of harmonics in the magnetizing current, due to the varying permeability of the steel at different inductions during the cycle, is first discussed. The brittleness of high-silicon steel and the rapid wearing of the dies used in punching it limit the silicon content to about 4 per cent, though a higher content would reduce the hysteresis and eddy-current losses. Thermal conductivities in watts per inch per degree centigrade are given as follows: Low silicon, longitudinal, 1.2; transverse, 0.014. High silicon, longitudinal, 0.5; transverse, 0.013.—*Electric Journal*, March, 1926.

Motors and Control

Electrification of Cane-Sugar Mills.—W. KOBS.—This article gives practical experiences in the complete electrification of cane-sugar plants, comparing requirements, operation and economies of steam and electric drives. A careful study has been made of the advantages of three methods of electric operation, viz., three-phase system, direct-current system with field control and direct-current system with both armatures and field control (Leonard). It is claimed that the direct-current systems are superior to the alternating-current method, but that the latter demands less attention to the motors. If, however, the total cost of the electrification is considered, the three-phase method will be found most advantageous. Only very accurate knowledge of circumstances and operation will

permit an exact predetermination of the actual superiority of one or the other method for any given installation.—*A. E. G. Progress*, February and March, 1926.

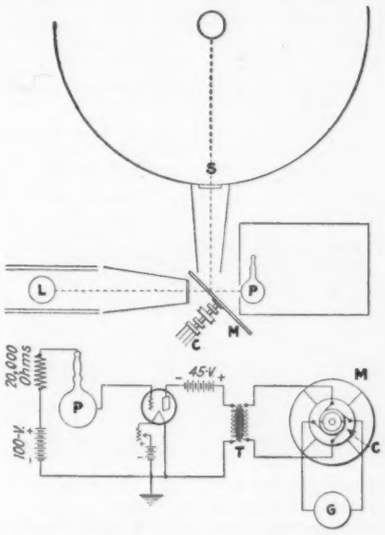
Heat Applications and Material Handling

Vibration-Type Conveyor.—H. HEYMANN.—If a metallic trough is loaded with material, such as coal, ore, sand or parcels, and if the right kind of periodic vibration is imparted to the trough, it will be found that the load is set in progressive motion, the trough becoming a conveyor. This principle is used to advantage in the new system described. The trough itself is supported on short springs made of ash or steel. The length of each conveyor unit can be up to about 100 ft. A three-phase motor of ¾ hp. to 1½ hp. output drives two slightly eccentric flywheels, and this power unit, in cooperation with a set of heavy helical springs, represents what the author calls the exciter of the conveyor. It is installed and connected at one end of the trough. Speed depends upon the load, a highest transportation rate of about 36 ft. per minute being reached at a motor speed of around 950 r.p.m. It is asserted that the shape or consistency of the transported material has no influence on the performance of the conveyor. Dry or wet goods, ice or hot castings, powder or sawdust, bulky parcels or filled sacks, are all conveyed with equal ease. The springs will stand up for several years, because their motion is only a few millimeters and remains far below the critical fatigue value. The small motor must be equipped with a shaft twice the size of the usual shaft, and its bearings must be extra-heavy ball bearings. — *Zeitschrift des Vereines Deutscher Ingenieure*, March 6, 1926.

Electrophysics, Electrochemistry and Batteries

Universal Constant of Thermionic Emission.—P. W. BRIDGMAN.—The constant A of the thermionic emission formula $I = AT^2e^{-b_0/T}$ has been shown by Richardson and Dushman by different lines of argument to be a universal constant, and a value of the constant has been deduced by Dushman. His experimental data verify this constant for pure metals, but for coated metals there are wide divergences. In the present paper an attempt is made to give a more rigorous deduction of the emission formula to find under what conditions it reduces to the simple form given. By making certain assumptions about the surface heat it is shown that A must have the value assigned by Dushman, that is, $A = 2\pi k^2 me/h^3$, and that the necessary and sufficient condition for this is that the difference between the specific heat of the neutral metal and of a charge on its surface shall vanish.—*Physical Review*, February, 1926.

Practical Form of Photo-electric Photometer.—CLAYTON H. SHARP and CARL KINSLEY.—One of the difficulties in the way of using a photo-electric cell in a photometer is that no form has yet been produced which has the same color sensitivity curve as that of the eye. However, by the use of suitable color filters comparisons can be made of lights differing in color within certain ranges. A second difficulty is the fact that the current set up by a cell is extremely small—on the order of 0.02 microampere with 100 volts on the cell and 1 foot-candle illumination—and its resistance is extremely high, e.g., 5,000 megohms in the case mentioned. This suggests the use of a triode amplifier if the indicating instrument is not to be excessively sensitive. In both the earlier and later forms of the photometer now described a single cell was used in order to avoid the effect of a possible dissimilarity. The cell was exposed alternately to one and the other of the light sources to be compared—that is, by a balance method, as in visual photometry. The principle of the final form of the instrument is shown in the diagram. As the sectioned mirror M rotates, the cell P receives light alternately from the test lamp in the sphere, by the window S and from the standard L, which is movable along a track. The



SCHEME OF PHOTO-ELECTRIC PHOTOMETER

circuits are evident from the lower figure. So long as there is an unbalance, a fluctuating voltage is generated in P and applied to the grid, resulting in a fluctuating current in the plate circuit and the primary of the transformer T. The commutator C in the secondary is in synchronism with the mirror and is so connected to the galvanometer that the latter deflects in one direction or the other according as one or the other light is the stronger. The standard L is then moved until there is no deflection, indicating balance of the lights. The position of L with reference to a fixed scale is a measure of the relative intensities.—*Transactions of I. E. S.*, February, 1926.

Closely Spaced Line Spectrum.—MARION EPPLEY.—A source giving a closely spaced line spectrum in the visible region is the spark between carbon electrodes coated with a fused mixture of the oxides of vanadium, titanium and molybdenum. A method for producing such a spectrum is described, and the spectrogram is reproduced.—*Journal Franklin Institute*, March, 1926.

Traction

Experiences with Electric Buses.—T. PANSERT.—The city of Lyons, France, made an experiment on a large scale to determine the economy of heavy storage-battery buses as compared with the gasoline-type of bus used throughout the city. Two routes were equipped with seven cars each, transporting weekly 15,500 passengers at a speed of 15 km. per hour. Although the cars could travel at 25 km. per hour, it was found more economical to operate them at the reduced speed of 15 km. Including the many stops, 7 amp.-hr. was found an average current consumption per kilometer. The total operating cost was 155 francs for every 100 km., while the gasoline buses cost 191 francs. A detailed description is given of the car, which carries an 800 amp.-hr., 40-lead-cell battery and is driven by the two 12-hp. series motors applied to the two rear wheels. The car runs on pneumatic tires, and the rear wheels are double ones. An over-all saving of 40 per cent is responsible for the gradual replacement in Lyons of all gas cars by storage-battery cars.—*Revue Générale de l'Electricité*, Feb. 27, 1926.

Telegraphy, Telephony, Radio and Signals

Propagation of Radio Waves Over the Earth.—A. HOYT. TAYLOR and E. O. HULBURT.—This paper presents a quantitative explanation of many fading phenomena. Starting with Larmor's theory of refraction due to the electrons in the Kennelly-Heaviside layer, which, however, does not explain the "skip distances" for short waves investigated by Taylor, the author works out a modification to fit the experimental facts. The range as a function of wave-length shows a minimum for about 200 m., which suggests the introduction of a critical frequency term. By taking into account the influence of the earth's magnetic field on the motion of the electrons a critical wave length appears in the equations for the refractive indices. Its value comes out as 214 m. if H is taken at 0.5 gauss. The skip-distance phenomena are regarded as demonstrating forcibly that one part of the transmitted wave clings to the earth and dies out rapidly while the other moves upward and is refracted from the upper layer with little attenuation. The law of this refraction and the magnitude of the skip distance depend on the electron density distribution. This latter is computed for four different assumptions. Comparison with experimental skip distances indicates that the waves which just reach the edge of the zone beyond are refracted around a curved path, reaching in the daytime a maximum height of from 97 miles to 149 miles. At this height the electron density is a maximum and is of the order 10^5. Other conclusions are: For waves of 60 m. to 200 m. total reflection may occur from the electron layers at all angles of incidence; short waves are propagated long distances by refraction in the upper atmosphere and reflection at the surface of the earth; waves below 14 m. cannot be efficiently used for long-distance transmission. — *Physical Review*, February, 1926.

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Alternators, Temperature Measurement in Revolving Fields of

The Leeds & Northrup Company has developed (and one operating company has installed) a graphic instrument for recording the temperature of turbo-generator fields. This scheme makes use of a double Kelvin bridge arranged to indicate temperature and to respond to the difference in voltage drop across the collector rings and that across a fixed external resistance of zero temperature coefficient. The General Electric Company and the Cambridge & Paul Co., both report the availability of indicating ohmmeters for the same purpose and that these instruments have been used rather extensively in marine work.—*H. R. Woodrow, Brooklyn Edison Company.*

Clay Drying

Experiments indicate that a clay body containing moisture has a rather high coefficient of thermal conductivity which enables heat to be supplied to all parts of a comparatively large specimen, even during extreme drying conditions and consequent rapid evaporation. The successful drying of heavy clay ware is dependent almost entirely on the ability of the clay structure to permit the water to come to the surface rather than on its ability to conduct heat to the center of the ware.—*Bureau of Standards, Washington.*

Color Analyzer

The novel features of this apparatus are the illumination and the variable rotating sector. The illuminating sphere (supplied for the first time on commercial instruments) enables measurements of spectral reflection under conditions of (approximately) diffuse illumination to be made as readily as measurements of spectral transmission. The variable sector enables the brightness of one beam to be continuously varied relative to the other and in such a way that transmissions and reflections are read directly on the scale of the instrument. The spectrometer is of the constant-deviation, direct-reading type.—*Keuffel & Esser Company, Hoboken, N. J.* [The cutting off of the ready supply of German instruments and the growing demand from commercial and scientific laboratories for a means of measuring and specifying color both added impetus to the development of spectrophotometric apparatus in this country, of which the above-mentioned device is an example.—EDITOR.]

Concrete Columns, Fire Resistance of

The wide difference in fire effects was determined as due in large part to different mineral composition of the concrete aggregates used. Concretes made with aggregates containing a high percentage of quartz, chert or granite are likely to crack and spall when subjected to fire of mild or moderate intensity and duration, while concretes made with calcareous aggregates, such as limestone or calcareous gravel, show little visible effect even from very severe fires. Concretes made with trap rock or blast-furnace slag give results intermediate between those made with siliceous aggregates and with calcareous aggregates.—*Bureau of Standards, Washington.*

Electrometer, Capillary

The ordinary Lippmann capillary electrometer consists on a single fine tube in which the rise of mercury depends upon the impressed voltage—for small voltages up to 1 volt. The new capillary electrometer is an inverted U-tube device whereby direct readings of the pressure difference between the two mercury levels can be made, thus obviating the necessity for assuming that the large surface in the reservoir is unchanged. Its advantages lie in its comparative simplicity, its sensitivity (one volt corresponding to 1.5 cm. deflection compared with 0.5 cm. for an ordinary Lippmann-type instrument) and its direct readings. For details see *Optical Society of America, Journal and Review of Scientific Instruments*, 1925, Vol. 11, page 411.

Lightning Arresters, Emergency Opening of

To insure the opening of the circuit to ground in case of the failure of the arrester a new scheme has been added to autovalve lightning arresters, so that in the event of failure of the arrester to prevent the power current flow, the bottom will drop out and the ground lead fall away, thus opening the circuit.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Micrometer Caliper, Electrically Controlled

A special micrometer caliper has been developed which is fitted with electrical control for remote operation. The essential parts of the instrument are a headstock and a tailstock supported by a heavy ring frame. The remote control is made possible by driving the headstock screw with a very small electric motor and having in the tailstock a mechanism which automatically stops the motor by opening electric contacts when the critical measuring pressure is reached. The caliper was designed for measuring the diameter of a precision single-layer inductance coil, while both coil and caliper were in a constant-temperature inclosure.—*Charles Moon, Bureau of Standards, Washington.*

Temperature Alarm

The low melting point of a mixture of paraffine, stearine and resinous gums is utilized. The device is simply a capsule containing such a mixture and covered with a mica window. When the mixture melts and runs out, a red background is exposed. The melting of the filler may also be utilized to close or to open an electric contact and thus to give a distant indication. These little capsules have been found quite useful in various industrial establishments and power plants.—*Laboratoire des Arts et Métiers, Paris, France.*

Transformers for High-Tension Testing, Chain Connected

Transformers are so designed that any desired number of units may be connected in cascade, increasing the test voltage as needed. As an example, the low-voltage side of each transformer may be provided with two 2.3-kv. windings (W_1) in parallel, and the high-tension side with a 350-kv. winding (W_2) in series with a 2.3-kv. one (W_3). The W_2 windings of all the transformers are connected in series, while each W_3 winding is connected to the W_1 winding of the next transformer. The last unit in the chain is simply a one-to-one transformer with two W_2 windings having a common terminal. Several such combinations have been supplied to large operating companies and to makers of high-tension apparatus.

In Progress or Purposed

Agriculture, Tests on Electric Power Requirements in

Experiments are being made on electric power requirements in various standard agricultural operations, such as threshing, feed grinding, wood sawing, etc. For details watch current issues of the *C.R.E.A. Bulletin*, published by the Committee on the Relation of Electricity to Agriculture, 1116 Garland Building, Chicago.—*E. A. White, editor of the Bulletin.*

Fuel, Liquid, from Coal

Arrangements are being made for the intensive study at the fuel research station of the problem of obtaining liquid fuels and other oils from coal under high pressures at moderate temperatures, while the basic problems of high-pressure work are included in the program of the chemical laboratory at Teddington, which is about to be opened.—*Department of Scientific and Industrial Research. 16 Old Queen Street, London, S.W. 1.*

Phonograph Records Made Electrically

The recording artist, in place of singing into a horn whereby a cut is mechanically made in the wax master record, sings into a broadcasting microphone or its equivalent. The electrically amplified output of this telephone transmitter is fed to an electromagnetically controlled cutting tool which engraves the master record. Much more nearly omnitonal and equitonal records can thus be produced, in view of the relative perfection of broadcast microphones and amplifiers. The power necessary to engrave the master record does not come from the voice of the singer but from the power supply of the amplifier.—*A. N. Goldsmith, Radio Corporation of America, New York.*

Phosphorescence, General Nature of

Arrangements have been made for a research into the general nature of phosphorescence. The stability of phosphorescent zinc sulphide has been examined, also the production of phosphorescent zinc silicate, and other materials which may be superior to it. This preliminary work has indicated the need for fuller investigation into the reasons why different zinc compounds or various forms of one and the same compound show marked differences in their sensitiveness to different regions of the ultra-violet spectrum and also differences in the time taken in showing full response to the exciting oscillations to which they are exposed.—*Department of Scientific and Industrial Research, 16 Old Queen Street, London, S.W. 1.* [This investigation bears upon the important practical problem of the production of cold light.—EDITOR].

Springs, Helical, Study of

An investigation is being made (for the engineering division of the United States Army Air Service) of the properties and the design of helical springs. The primary object is to obtain knowledge which would be useful in the design of precision instruments. It was planned to secure a number of sizes of wire of various metals and alloys, to make helical springs of these wires and to study their performance; however, only phosphor-bronze springs have been constructed and tested. It is hoped that the work can be extended in the near future to include steel springs. For details see *Optical Society of America Journal*, 1925, Vol. 11, page 519.—*W. G. Brombacher, Bureau of Standards, Washington.*

X-Ray Laboratory for Precision Research

An installation fitted under Professor Duane's supervision in the Cruft high-tension laboratory comprises a 50-kv. lead storage battery (24,576 cells), an X-ray spectrometer and the necessary auxiliary equipment. It is planned to double the number of cells so as to have 100-kv. direct current available.—*Harvard University, Cambridge, Mass.*

Suggestions for Research

Dielectrics, Sheet, Photographic Study of

Reboul has found (*Comptes Rendus*, 1920-21, Vol. 171, page 1052; Vol. 172, page 210, and Vol. 173, page 222) that a sheet of paper can make an image of its fiber structure upon a photographic plate when a current is passed between two electrodes applied to the paper at different points. Equipotential lines are also roughly shown. It seems as though this phenomenon might be of use in a study of sheet dielectrics and in mapping two-dimensional fields.

Magnetic Field Density, Measurement of

In the *Archiv für Elektrotechnik*, 1925, Vol. 14, page 354, F. Schroter has described a new device for measuring weak magnetic fields in the air. The device consists of a flexible conductor carrying direct current and stretched between two flat springs. When placed at right angles to the field, the conductor deflects, and the current is so adjusted that the middle point of the conductor just touches a stop, causing a click in a telephone receiver. There are many practical problems, such as leakage flux distribution, in the solution of which the new device should prove to be of service.

News of the Industry

I. E. C. Now Hard at Work

Enthusiasm Marks Arrival of Nearly One Hundred European Delegates to Participate in International Standardization of Electrical Ratings and Nomenclature

WHEN the *Adania* from Hamburg, Southampton and Cherbourg, carrying nearly a hundred delegates besides members of their families to the sessions of the International Electrotechnical Commission arrived at her New York pier last Tuesday, a reception committee, flanked by a band of daily press representatives, was on hand to extend hearty American greetings. The boat was much behind its scheduled time, and this necessitated the shifting of the committee meetings scheduled for the morning and afternoon of the opening day, but the official welcoming meeting was held according to program at the Engineering Societies Building in the evening.

Colonel R. E. B. Crompton, honorary secretary of the commission, who bears his eighty-one years lightly, was the official spokesman of the visitors. Sir Richard Glazebrook, chairman of the British National Committee; Sir Archibald Denny, chairman British Engineering Standards Association; L. B. Atkinson, former president of the Institution of Electrical Engineers, and C. P. Sparks, vice-chairman of the British National Committee, were other prominent delegates from Great Britain. Guido Semenza, president of the commission, and Prof. L. Lombardi, president of the Italian Electrotechnical Committee, headed the delegates from Italy; Dr. Carl Strecker, president of the German Electrotechnical Committee, and Dr. Rudenberg of the Siemens-Schuckertwerke were among Germany's representatives, the first group of German engineers to make a formal visit to the United States since the war; E. Genissieu, chief hydraulic engineer of the Ministry of Public Works, J. J. Frick and E. Roth headed the Frenchmen; Prof. M. Châtelain, chairman of the Russian Electrotechnical Council, was accompanied by other Russian engineers, and Austria, Belgium, Czechoslovakia, Holland, Norway, Poland, Sweden, Switzerland and Spain were all represented. A list of the foreign delegates will be found in the issue of the ELECTRICAL WORLD for April 3, page 725.

In the reception committee which met the boat were John W. Lieb, chairman of the committee and vice-president New York Edison Company; Frank W. Smith, vice-president United Electric Light & Power Company; Charles E. Skinner, president American Engineering Standards Committee; Paul G. Agnew, secretary American Engineering Standards Committee; Fred R. Low, ex-president American Society of Mechanical Engineers and editor of *Power;* Elihu Thomson, ex-president International Electrotechnical Commission; C. O. Mailloux, ex-president and now honorary president of the International Electrotechnical Commission and one of its earliest and strongest promoters; Clayton H. Sharp, president of the American National Committee, and Profs. A. E. Kennelly and Comfort A. Adams of Harvard University.

Before the visiting engineers were driven to their headquarters in the Hotel Astor in thirty cars flying the blue pennant of the Engineering Societies, Colonel Crompton said to the newspaper men:

"This organization is the real League of Nations and is very much more valuable in bringing people together and in forming a real union between them than is the other League of Nations. We have done everything to bring the engineers of the world to a better and harmonious footing, and we have a great deal before us yet to do. Our general work is to see that the same value is given for the same thing for all people. So far we have dealt only with electrical standardization, but we have before us the great work of general standardization not only in scientific matters but in all matters to which standardization applies. One question that may be brought up in this meeting is that of the adoption of the metric system, but I do not believe that the English-speaking people will ever consent to it. As a matter of fact, we make approximately all the world's machinery, and we can hardly be expected to take up the system that the rest of the world uses."

FOUR PROMINENT I. E. C. DELEGATES
Left to right—Dr. Carl Strecker, President Semenza, Sir Richard Glazebrook, Col. R. E. B. Crompton.

Professor Châtelain gave out a statement on the scientific and electrical awakening in Russia, and delegates from Germany outlined international standardization plans entertained by that nation.

THE OFFICIAL WELCOME

The evening meeting of welcome, under the chairmanship of John W. Lieb, was well attended. Secretary Hoover was unable to be present, but he telephoned a greeting from Washington which was amplified and transmitted directly to the auditors. "No one," Mr. Hoover said, "will deny that to-day electricity is the greatest tool that has come to the hand of man. But if we would have the freest flow of discovery and invention, we must first have common terms and common standards."

Thomas A. Edison, honorary head of the reception committee, sent a telegraphic greeting from his winter home in Florida. A cablegram from Lord Balfour, former Premier of Great Britain, was read. Dr. Elihu Thomson welcomed the delegates on behalf of the United States National Committee, and Dr. Howard T. Barnes, president of the Canadian National Committee, extended greetings from the Dominion. Responses were made by Colonel Crompton for Great Britain, E. Genissieu for France, A. F. Enstrom for Sweden, Prof. V. List for Czechoslovakia and Dr. Strecker for Germany.

President Semenza then made an address on "Accomplishments and Aims of the International Electrotechnical Commission." "When we unify nomenclature in electrical science and manufacture, and when we establish unified ratings for machines," Signor Semenza said, "then we shall have simplified production."

LUNCHEON AT THE COMMODORE

A luncheon was tendered the delegates to the commission at the Commodore Hotel on Wednesday, and a large audience listened to several good speeches. John W. Lieb presided as toastmaster and traced the growth of standardization from its inception by the American Institute of Electrical Engineers in 1898. He urged a program of international standardization for all industry under the auspices of one agency. Good feeling and friendliness should prevail, he said, and every effort at standardization should be encourgaed to develop along unified and co-operative lines. He urged that the present meeting be the starting point for a complete international standardization program.

In a fine talk Dr. M. I. Pupin, president of the American Institute of Electrical Engineers, outlined the philosophy of standardization in terms of the neighborliness and friendliness experienced in his youth. He urged the need for this work and indicated its possibilities for engendering a true League of Nations in industry.

Sir Archibald Denny of Dumbarton, Scotland, also argued for a broad program of international standardization. He told how Great Britain had developed one standardizing agency for all industry by building on a program of general helpfulness.

President Semenza promised the full support of the commission to any program of international standardization, even though such a program might mean the subordination of the commis-

sion itself. Dr. C. H. Sharp and Dr. C. O. Mailloux were other speakers who welcomed the visitors and indicated the ideals and aims of the work which is in hand.

REGULAR SESSIONS BEGUN

With Wednesday morning the real work of the conference began with papers by the experts on machine ratings and kindred subjects. These meetings will continue in full swing up to Wednesday, April 21, inclusive, and, in addition to hydraulic topics, will embrace sessions on standard voltages, transformer oils, high-pressure tests, traction motors, lamp holders and caps, prime movers, terminal markings, and transmission-line rules and regulations. On Saturday and Sunday, the only days for which no committee meetings are scheduled, conferences especially representing the various national standardization bodies will be held. The ELECTRICAL WORLD'S report of the technical meetings will appear in a later issue.

New York Companies to Have Enlarged Home

An eighteen-story structure with a tower extending six additional stories is to be erected for the Consolidated Gas Company and its electrical subsidiaries, including the New York Edison Company and the United Electric Light & Power Company, in New York City on the corner of East Fourteenth Street and Irving Place, a site now occupied by the historic Academy of Music. The new building, which will be exclusively used by the public utility companies, will adjoin the Consolidated Gas Company's present building at Irving Place and East Fifteenth Street and will give the company possession of this entire block.

The new tower will be 425 ft. in height and will be visible from many parts of the greater city. It will be surmounted by a decorative feature and will contain a clock face 16 ft. in diameter on each of its four sides. A powerful searchlamp will be installed at the summit of the tower and the building will be floodlighted.

Tacoma's New City Plant Is Almost Ready

Before the end of April it is confidently expected that President Coolidge will be asked to touch the button at the national capital that will officially release power from the new Lake Cushman municipal hydro - electric plant of Tacoma, Wash., for service in that city. Three weeks ago, after a preliminary celebration, one of the two 25,000-hp. units was synchronized on the line and its load built up to approximately 12,000 kw. and Tacoma is already receiving Cushman power at intervals. A second celebration will follow the full operation of the plant, when the towers carrying the transmission line across the Narrows of Puget Sound into the city will be christened.

Before its absorption Lake Cushman lay in the gorge of the North Fork of the Skokomish River in the foothills of the Olympic Mountains, 50 miles northwest of Tacoma. The somewhat unusual scheme by which 140,000 hp. may eventually be generated by the installation in a second plant of two 45,000-hp. units was described two years ago in Vol. 83 of the ELECTRICAL WORLD (pages 206, 798 and 894). The second dam, to be built below the present power house, will make complete use of the 475-ft. hydraulic head between tailwater of the existing plant and tidewater. From the Cushman switchyard a double-circuit 110-kv. transmission line follows a direct route (44 miles) to the terminal station at Tacoma, where the voltage is stepped down to 50,000, the rating of the bus line that loops the city.

Nine Bids for Muscle Shoals Properties

Of These the Union Carbide, American Cyanamide, Southern Power Companies', Hepburn and Hooker Offers Will Be Considered—Two Synopses Issued

BY PAUL WOOTON
Washington Correspondent ELECTRICAL WORLD

NINE bids for the Muscle Shoals properties of the government were submitted to the joint congressional committee on or before noon April 10. The committee has announced that five of the nine bids are being considered. They are the bids of the Union Carbide Company, the American Cyanamide Company, the Muscle Shoals Power Distributing Company and Muscle Shoals Fertilizer Company, Frederick T. Hepburn, and Elon H. Hooker and associates. The other bids, which do not come within the terms of the resolution, were from F. E. Castleberry, Shreveport, La.; Lloyd H. Smith, Battle Creek, Mich.; C. E. Graff, of the American Nitrogen Products Company, Seattle, and James F. Levering, Washington, D. C. Bids which may be received prior to the submission of the committee's report will be filed with Congress with a statement that they were received too late to be analyzed and considered.

The offer of the Muscle Shoals Power Distributing Company and the Muscle Shoals Fertilizer Company was made in behalf of the following public utility companies: Tennessee Electric Power Company, Chattanooga; Memphis Power & Light Company, Memphis; Mississippi Power Company, Gulfport, Miss.; Mississippi Power & Light Company, Jackson, Miss.; Mississippi Delta Power & Light Company, Greenville, Miss.; Alabama Power Company, Birmingham; Gulf Power Company, Pensacola; Kentucky Utilities Company, Louisville; Gulf Electric Company, Mobile; Georgia Railway & Power Company, Atlanta; Louisiana Power & Light Company, Monroe, La.; Arkansas Light & Power Company, Pine Bluff, Ark., and New Orleans Public Service, Inc.

The bids have been referred to the interdepartmental advisory committee consisting of Dr. F. G. Cottrell, director of the fixed-nitrogen research laboratory of the Department of Agriculture; Dr. Elwood Mead, Commissioner of Reclamation; General Harry Taylor, Chief of Engineers, and Paul Clapp, an electrical engineer on the staff of the Secretary of Commerce. No information is being given out by the committee as to the character of the offers made.

Thomas W. Martin Makes Statement on Muscle Shoals Bid

Thomas W. Martin, in his capacity as president of the Muscle Shoals Power Distributing Company, on Tuesday made public the following statement:

"Published accounts of proposals for Muscle Shoals dealing with the offer of the affiliated public utility companies of the South give the impression, in part at least, that that offer is mainly concerned with power distribution. It ought to be said that that proposal recognizes the primary importance of leasing the properties for private operation to guarantee adequate production of nitrogen, first as a measure of national defense, second as a benefit to agriculture through the manufacture of fertilizer, and, third, the distribution of surplus power to the public under regulation.

"The proposal of the power companies is designed to provide the most effectual fulfillment of those purposes without the appropriation by the government of one single additional dollar for Muscle Shoals. The production of nitrates is the foremost consideration. All the power to be generated will be made available for national defense and for fertilizer production and will be devoted to that purpose if the needs of the nation and the demands for fertilizer require. In view of the fact that it has been recognized by Congress that there will be power at Muscle Shoals under varying conditions that may not be required for nitrate manufacture, the joint resolution of Congress under which bids are considered stipulates that such surplus power should be distributed to the Southern States. The power companies' offer contemplates such distribution throughout the South after fertilizer needs are met, and only after fertilizer needs are met. Only through interconnection with existing and future auxiliary plants can the fullest development of the maximum power resources at Muscle Shoals be attained and made available for use for national defense, fertilizer production or distribution."

Elon H. Hooker Explains Bid of Himself and J. G. White

In the case of the Hooker offer a statement was authorized by Mr. Hooker which in part follows:

"A bid for the Muscle Shoals properties was presented to the joint committee today by Elon H. Hooker and J. G. White. The offer devotes its primary attention to fertilizer production and presents several features different from the original proposal made by this group two years ago. A fertilizer distribution arrangement through the

agency of the farm co-operatives is announced whereby the farmers will retain through reduced prices all of the intermediate expenses now involved in fertilizer distribution, leaving a moderate manufacturing and distributing profit for the operators. The profit on fertilizer production is limited to 8 per cent, and 75 per cent of the earnings of the enterprise goes to the government. The government's earnings for the term of the lease are estimated at $300,000,000.

"The offer provides for a National Muscle Shoals Council of fifteen members for the purpose of safeguarding and protecting the mutual rights and interests of the United States and the bidders. The Muscle Shoals properties are to be leased for a fifty-year term and the power devoted primarily to the manufacture of concentrated fertilizer. The operators state that Nitrate Plant No. 2 can be largely utilized for the production of fertilizer by means of recent developments in the chemical field, with which Mr. Hooker has been identified as a manufacturer for 30 years.

"The offer is based on a co-operative arrangement with the government whereby the operators guarantee to administer and develop the plant, the government furnishing the capital necessary to complete and modernize it and to insure operation. For this three-quarters of the net earnings will be paid to the government as its share, the operators retaining one-quarter for their services. The earnings from power will be devoted to the development of fertilizer production and distribution. The proposal offers to develop the upper Tennessee and requires the building of Dam No. 3. The company will be capitalized in accordance with the wishes of the joint committee, and not less than $1,000,000 of this capitalization is to be paid in upon the signing of the contract."

Shawinigan and Saguenay

Power Company to Use 100,000 Hp. from River and to Build 150-Kv. Line to Quebec City

ALTHOUGH no official confirmation of the rumored purchase (noted last week) by the Shawinigan Water & Power Company and the Aluminum Corporation of America of the Duke-Price hydro-electric interests in Quebec is forthcoming, an agreement, the details of which have not yet been divulged, has, it is understood, been entered into by which the Shawinigan Water & Power Company, to meet the requirements resulting from the industrial growth of eastern Quebec, is to obtain 100,000 hp. from the big development on the Saguenay River. Preliminary arrangements for the installation of transmission lines between the Saguenay and the city of Quebec are understood to have been made, the line to be completed early in 1927.

This power will either be utilized through the Quebec Power Company, the Shawinigan's subsidiary, or directly distributed by the Shawinigan company. The 100,000 hp. will be especially needed for the operation of the Anglo-Canadian pulp and paper mills, which are to be erected on the St. Charles River, and most likely also for the St. Regis paper mills at Cap Rouge. The transmission line between Ile Maligne and Quebec city will, it is said, be operated at a higher voltage than any other line in Canada. It will extend about 150 miles and the voltage will be 150,000, as compared with 110,000, the voltage of the line linking the Shawinigan power developments in the St. Maurice district with Montreal.

Frontier Corporation's St. Lawrence Plans

Colonel Cooper Explains Revised Project Which Contemplates a Single Dam at Barnhart Island, Where 2,400,000 Hp. Could, He Says, Be Generated

AGAIN appearing before the New York State Water Power Commission on Friday, April 9, Colonel Hugh L. Cooper gave testimony on the amended application of the St. Lawrence Valley Power Corporation, in which the Frontier Corporation is interested, for a permit to develop 2,400,000 hp. at Hawkins Point at the foot of Barnhart Island in the St. Lawrence River, 43 miles northeast of Ogdensburg.

Detailed plans filed with the commission show that the company contemplates the erection of a generating plant of 24 units, each capable of developing 50,000 hp. on both the American and Canadian sides of the river. The length of the power stations would be approximately 1,900 ft. and the length of the dam 1,900 ft. The plans as originally filed, which called for two developments, one at Cat Island, have been amended, Colonel Cooper testified, so as to accord with the best navigation scheme that can be devised and will fit in with any plan for a government ship canal if one should be constructed.

It is now proposed to build only one dam, which from base to crest would be 130 ft. in height, giving a head of 83 ft. It is proposed to maintain the water level at 246 ft. above sea level, which is virtually the level of Lake Ontario. For a distance of about 14 miles back it would be necessary to construct dikes of varying heights to protect the surrounding country from flooding. The rise in level of the water in the river would gradually taper down until at Ogdensburg it would be approximately one foot, while at the Thousand Islands it would scarcely be noticeable. A number of small islands would be completely submerged and many of the larger islands partly submerged by the impounding of the water. It would be necessary as a part of the project to relocate numerous roads and railroad rights-of-way.

It was brought out at the hearing that not only would the dam be no detriment to navigation, but in the fact that it would set back water to Lake Ontario it would improve navigation for the distance between the new dam and that point, for the reason that it would do away with upward of half a dozen locks up stream as well as with swift currents and shallow channel conditions.

The estimated cost of the project, which includes the construction of the dam and dikes, the erection of the generating plants and power houses, the changes in roads and railroads and the payment of property damages, is $238,000,000, or slightly under $100 per horsepower. This figure does not, of course, include transmission lines, but is the estimate for the project complete with wheels ready to turn. It is estimated that the work could be completed in 54 months from the time of starting, five working years. Detailed estimates of the distribution of the various costs will be filed at a later date.

The plans as filed now go to the State Engineer and Surveyor for examination. Should he wish further information, additional hearings may be held, but it is expected the plans now in the hands of the Water Power Commission will form the basis of the development if a permit therefor be granted. The company had made no application for Canadian approval as yet, Mr. Cooper told the commission.

President Bishop of the Frontier Corporation testified, in answer to a question, that the General Electric Company was "in thorough sympathy with this commission and with the policy it has pursued." A hearing will be held in May on the application for a St. Lawrence site received from the

ARCHITECT'S DRAWING OF FRONTIER CORPORATION'S ST. LAWRENCE PROJECT

American Superpower Corporation. It was learned at the office of the State Attorney-General that a definite reply is expected from federal authorities within a few days as to the federal attitude in relation to the construction of the conflicting provisions in the federal and New York State water-power laws.

Gaby Throws Doubt on Estimate of Possible Output

In the opinion of F. A. Gaby, chief engineer of the Ontario Hydro-Electric Power Commission, says a message to the ELECTRICAL WORLD from Ottawa, Canada, the development of 2,400,000 hp. of continuous energy on the international section of the St. Lawrence River at a point 40 miles below Ogdensburg is not possible. "Colonel Cooper must have been referring to connected load," Mr. Gaby said. The Ontario Hydro-Electric Power Commission's estimate of power to be had from a single-stage development of 74.5-ft. head is 1,861,840 hp. This compares with the head of 83 ft. proposed by Colonel Cooper. Mr. Gaby also remarked that the declaration of Colonel Cooper that this power could be made available within four and a half years was an optimistic view. He said that previous estimates were that the work would take from eight to ten years.

Compound Rate Suggested for Small Company

In dismissing a petition of customers of the Harvard Massachusetts Gas & Electric Company for a reduction in the price of electricity below 18 cents per kilowatt-hour, the Massachusetts Department of Public Utilities has suggested that a service charge or area rate might be advantageously applied to encourage the use of electricity. The commission found that the system is economically managed and built and that the aggregate of payment on its stock and notes is not in excess of a reasonable return on the cost of the property. It appeared that a substitution of a rate of 14 cents a kilowatt-hour, with an additional service charge of 60 cents per customer per month, would diminish the present income of the company by about $550, provided the volume of business remains the same. The company has announced its willingness to adopt a compound rate if the customers desire.

New England Men Meet at Boston and Elect Officers

Sales opportunities in the industrial heating, heavy-duty-cooking, lighting and residence service fields were featured Wednesday at a largely attended meeting of the Commercial Section, New England Division, N.E.L.A., at Boston, Chairman P. J. Wilson of Lowell presiding. At a Power Bureau session in the morning the principal speakers were F. K. Simmons, Pawtucket, R. I.; L. V. Clark, Waterbury, Conn.; J. L. Faden, Boston; H. I. Laumann, Lynn, Mass.; H. Burgi, Portland, Me.; G. H. Sander, Manchester, N. H.; C. T. Myrick and L. R. Wallis, Boston. The afternoon session was devoted to merchandising topics, with addresses by P. B. Zimmerman, National Electric Lamp Works, Cleveland; Earl E. Whitehorne, commercial editor ELECTRICAL WORLD, and Miss Elizabeth McDonald, professor of home economics, Boston University. Selling the complete electric home idea was stressed by Mr. Whitehorne, who urged getting away from piecemeal appliance merchandising.

Officers were elected at the annual business meeting of the division as follows: President, Walter P. Schwabe, Thompsonville, Conn.; vice-president, Fred D. Gordon, Portland, Me.; treasurer, G. M. Guilford, Boston. Chairmen of sections will be: Accounting, C. J. Allen, Waterbury, Conn; Commercial, L. A. Fiorani, Franklin, Mass.; Public Relations, S. T. MacQuarrie, Boston; Technical, T. H. Haines, Boston.

Technical Men Discuss the Engineer as an Executive

A large attendance in the auditorium of the Engineering Societies Building, New York, on Wednesday evening, April 14, attested the interest in the subject discussed, "Qualifying Engineers for High Executive Positions." The session was a joint meeting of the major societies and was under the chairmanship of Kingsley L. Martin. The speakers were E. M. Herr, president of the Westinghouse Electric & Manufacturing Company; H. A. Guess, vice-president of the American Smelting & Refining Company; Dr. Frank B. Jewett, vice-president of the American Telephone & Telegraph Company, and J. C. Parker, vice-president and chief engineer of the Brooklyn Edison Company.

Although the speakers followed more or less divergent courses, treated the subject from different standpoints and said that no simple set of cardinal qualifications could easily be laid down, they all were agreed on what might be termed the inherent qualification of the executive—the ability to guide and direct others, an ability that is inborn and not acquired, but which, if it exists at all, can be developed. It was pointed out that a course of study alone was not sufficient and that the ability must reside in the individual himself. It was considered necessary to have an accurate knowledge of the fundamentals of an engineering education and that a thorough training should embrace humanistic and cultural studies. It was necessary for the executive to have a thorough understanding of human relationship and to have the ability to learn and appreciate other men's points of view. Character and personality were held to be of prime importance, since the character of the executive is reflected throughout the organization and even in the character and quality of the product. Training, it was said, should be largely in the business itself, and unselfish, self-sacrificing devotion to work must prevail in the highest degree if one aspires to an executive position. Engineering is so prominently involved in present business that the best field for executives was said to be among the engineers.

N.E.L.A. Men Startled

Editor Tells Southwestern Division Central-Station Income Is Only Third What It Should Be

THE Southwestern Geographic Division of the National Electric Light Association and the Southwestern Public Service Association met in joint session at Galveston, Tex., on Tuesday to Friday of this week. James E. Davidson, president of the N.E.L.A., and Frank R. Coates, president of the American Electric Railway Association, were in attendance.

Extension of the benefits of electricity to rural and farming communities, a closer relation between the utilities and the general public and the work of the women in the industry, in addition to the address of C. J. Griffith of Little Rock, Ark., president of the division, were high points in Tuesday's sessions. Papers covering the activities of the different sections of the division were read at Wednesday's meeting. Among the speakers were T. P. Walker, manager of the El Paso Electric Company; R. I. Brown, commercial manager of the Arkansas Central Power Company; W. B. Tuttle, president of the San Antonio Public Service Company; E. T. Keck, power superintendent of the Texas Power & Light Company; Ralph S. Child of Bonbright & Company, New York, who spoke on public utility financing, and Managing Director M. H. Aylesworth of the N.E.L.A., who discussed association affairs. P. L. Thomson of the Western Electric Company addressed himself to the subject of building public confidence, and domestic refrigeration was discussed at length by President H. B. Flowers and Commercial Manager W. E. Clements of the New Orleans Public Service, Inc., who told of the progress made in New Orleans in placing refrigerators in homes and in coming to an understanding with the ice dealers of that city.

At Thursday's session the chief speaker was W. H. Onken, Jr., editor ELECTRICAL WORLD, who startled the meeting by declaring that the electric public utility companies of the country were neglecting the most lucrative end of the business in not building up their residential loads and offering rates which will induce housewives to install and use all sorts of electrical appliances. Instead of generating sixty billion kilowatt-hours, he said, the industry, if it had seized and made the most of its opportunities, would now be generating four times that amount and its income would be treble what it is at present.

Government ownership was scheduled to come in for a good trouncing at the hands of Dr. H. M. Payne of the American Mining Congress at Friday's session. Officers were elected at follows: President, H. B. Flowers, president New Orleans Public Service, Inc.; vice-presidents—from Mississippi, E. E. Armstrong of Gulfport; from Texas, J. G. Holtzclaw of Beaumont; from Oklahoma, Fred W. Insull of Tulsa; from Arkansas, J. L. Longino of Pine Bluff, and from Louisiana, A. G. Curtis of Shreveport. A. B. McCoard of New Orleans was appointed treasurer, and S. J. Ballinger of San Antonio was continued as secretary. Next year's convention may be held at New Orleans.

Radio Interference Tackled

Des Moines Convention Takes up This Problem and Debates Sundry Commercial Possibilities

OPPORTUNITIES for greater commercial achievements and co-operative handling of the radio-interference problem were "high points" of discussion in the last two days of the Middle West N. E. L. A. convention at Des Moines on April 7 to 9. The opening day's proceedings were reported last week. Besides the subjects named, some features of high-tension-line construction, the relations of holding companies with subsidiaries, public relations and women's activities in the industry shared the attention of the delegates.

E. W. Lloyd, chairman of the Commercial National Section, recommended a thorough study of domestic rates by commercial departments to ascertain if they can be made more attractive as regards ranges and refrigerators. If every domestic customer could be led to consume 30 kw.-hr. a month, it would mean $225,000,000 additional revenue. Mr. Lloyd thought it would be a safe policy to spend the first year's income from refrigerators in placing others on the market, but merchandising costs should be kept.

Industrial lighting was the topic of P. Y. Danley, South Bend, Ind., who presented charts indicating a 25 per cent increase in the sales of four leading manufacturers of porcelain-enameled reflectors as a result of the industrial lighting campaign. T. F. Kennedy of Henry L. Doherty & Company presented an excellent paper on developing new business, which is noted on page 819. Utility merchandising was discussed by C. F. Farley of Kansas City, who declared that uniformed metermen sold 50 per cent more goods than salesmen, that profits on energy-consuming devices can advantageously be spent in stimulating their sale, that leasing of appliance departments to dealers is effective and that portable lamps make attractive displays and afford a rapid turnover.

Methods of building the lighting load in towns of 8,000 to 10,000 population were explained by Robert Geid, Huron, S. D., who said that free consultation, trial installations, exemplary lighting, sign maintenance, demonstrations and co-operation with architects and builders had doubled the lighting revenue from individual commercial customers in South Dakota. The benefit derived from a sales campaign at St. Joseph, Mo., was briefly presented.

National President Davidson contended that timidity or the "inferiority complex" has evidently kept utilities from realizing the commercial possibilities open to them. He pointed out that monthly domestic bills are less than the price of an Easter hat and that there are more automobiles than wired homes. More extensive merchandising, surveys of uses and possibilities and the pushing of domestic refrigerators and electric heat applications in the home, in business and in industry were urged by Mr. Davidson, who also dwelt on the opportunity for rural service in the Middle West.

The keynote of the session on radio interference was the desire of the central-station companies to understand the public attitude and to co-operate with listeners to broadcast programs in the elimination of defects. Two papers were read by H. A. Luckey of the Radio Listeners' League of Indianapolis and Francis St. Austell of the Iowa Radio Listeners' League. R. O. Smith, Radio Corporation of America, expressed his views, and W. R. H. Baker went into considerable detail in diagnosing possible causes of trouble, suggesting remedies and explaining how trouble sources can be located.

J. E. Denman explained the value of parent or financing companies to subsidiaries, the desirable relationship between them and how it can be brought about. Before the public can be expected to recognize the value of holding companies, he said, utility representatives must themselves be better informed than they apparently are at present.

F. H. Brooks, vice-president and general manager of the Continental Gas & Electric Corporation, was elected president of the Middle West Division. Donald M. Sterns of Fort Dodge, Iowa; F. S. Dewey of Kansas City, Mo., and R. T. Smalley of Emporia, Kan., were elected vice-presidents. H. M. Davis of Lincoln, Neb., was re-elected secretary-treasurer. Of the Iowa Section C. S. Macy of Adel was elected president; George A. Neal, Fort Dodge, first vice-president; E. F. Buhlman, Centerville, second vice-president, and H. E. Weeks, Davenport, re-elected secretary-treasurer.

Development on Gatineau

International Paper Company to Utilize 125,000 Hp. on Tributary of Ottawa River

HUGE power developments being undertaken by the International Paper Company on the Gatineau River in the Province of Quebec, a few miles from Ottawa, Ontario, are attracting no little attention. Definite official details of this great engineering task were recently given to a gathering in Ottawa by James H. Brace of the Fraser-Brace Engineering Company of Montreal, which is constructing the power plants. The salient features of the project are:

1. A dam across the Gatineau River, about 100 miles north of Ottawa, which will create a storage lake of 64,000 acres, more than 60 miles long and several miles wide.

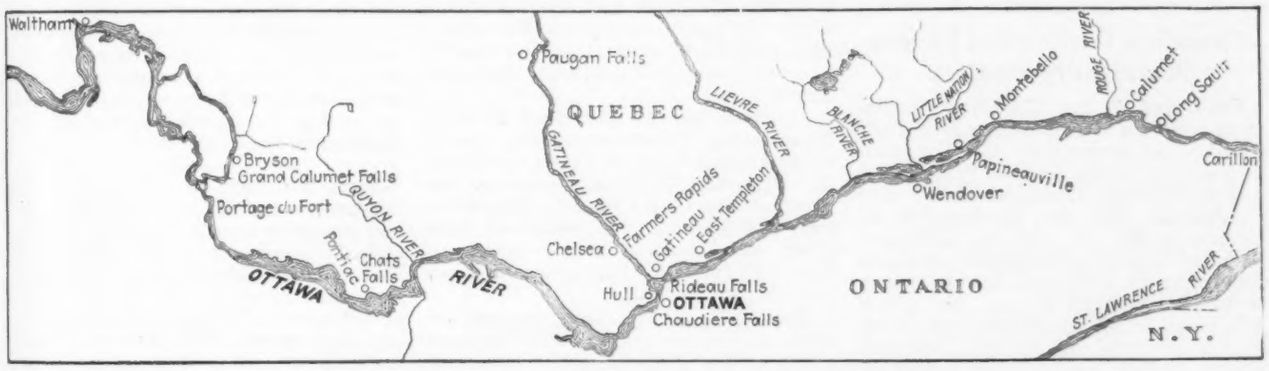
2. A dam at Chelsea, about 9 miles from Ottawa, to be 109 ft. high, which will hold back the water of the Gatineau River 12½ miles, wiping out all the falls and rapids and creating a huge lake. This dam will make available at all times 74,300 hp.

3. A dam at Farmers Rapids, about a mile below Chelsea. The dam will be 75 ft. high and will give 51,700 continuous horsepower.

4. A paper mill near East Templeton on the Ottawa River, with an initial capacity of 500 tons of newsprint per day.

Of the 125,000 hp. to be developed, 35,000 hp. will be required for driving the machinery of the mill. The rest will be used for producing steam for drying paper and for other heat purposes until there is a demand for it from the outside for the ordinary use of hydro-electric power. The power development which is most advanced at present is at Chelsea. The dam at this point, together with the power house, will have a total length of 1,600 ft. The working elevation of the tailrace below the power house will be 222 ft. and the water surface above the dam 318 ft. Provision is to be made for the installation of four 3,000-hp. turbines. Three are to be installed during the present year.

The total length of the dam to be built at Farmers Rapids, including the power house and wing walls, is 4,800 ft. Provision is being made in the power house at this point for four 21,000-hp.



OTTAWA RIVER AND SOME OF ITS TRIBUTARIES AND WATER-POWER SITES

The above map shows the sites where developments are under way by the International Paper Company on the Gatineau River, as well as the location of developments and proposed developments on the Ottawa River. Chief among the latter are those existing or contemplated at Carillon, Chaudière Falls, Chats Falls, Grand Calumet Falls and Bryson.

turbines and generators, three of which it is expected will be installed this year. Part of the more important auxiliary work required in connection with the enterprise is the transmission lines which must be built to carry the power from Chelsea and Farmers Rapids to the mill site, about 12 miles from Chelsea.

In addition to these developments, the International Paper Company, as noted under "Purchases and Mergers," is reported to have bought the Hull Electric Company and the Hull Electric Railway Company, whose holdings include important power sites at Deschenes on the Ottawa River, about 5 miles above Ottawa, and at Paugan Falls on the Gatineau River, about 50 miles north of Ottawa. By this move the International Paper Company would obtain control of all water power on the Gatineau, an ultimate total of 200,000 hp. The project at Paugan Falls, which was commenced by the Canadian Pacific Railway two years ago, will provide for a dam 100 ft. high, behind which will be created a large lake where 10,000 hp. can be developed.

Canadian Parliament Favors Morrisburg Project

On April 7 the Canadian Parliament went on record as approving the granting of permits by the Dominion government to the Ontario government and the Ontario Hydro-Electric Power Commission for the development of electric power on the St. Lawrence River at Morrisburg, Ontario, and also for using an increased flow of water from the Niagara River. No action will be taken by the government in the way of granting such permits, however, before it has received the report of the international board of engineers acting in behalf of Canada and the United States and now investigating the question of St. Lawrence developments. The Ontario government and the Hydro-Electric Commission have been making annual application for such permits since 1923, but the Dominion government has withheld them on the ground that since the development of power on the St. Lawrence at the point in question has an international aspect, there should be an understanding between the United States and Canada as to the best means of developing the water power on an equitable basis.

During the discussion in Parliament Charles Stewart, Minister of the Interior, assured the House that once the report of the international board was received action would be taken by the government on the Ontario applications and there would be no holding up of the development. With reference to the difference of opinion between engineers as to whether there should be one or two developments at Morrisburg, Mr. Stewart declared that personally he favored two developments. Arthur Meighen, leader of the Conservative party, said he could develop no optimism as to early action by the government. General A. E. Ross, Kingston, Ontario, said that as far as eastern Ontario was concerned the position would be worse than at present if canalization was recommended.

Purchases and Mergers

Pierce Plants in Middle West and East Merged—Ottawa River Sites May Change Hands

FORMATION of the Central Gas & Electric Company to operate utility plants in 69 communities of Illinois, Wisconsin, Michigan, Indiana, New York, Maine and New Brunswick was announced last week by Colonel A. E. Pierce of Chicago, who will be president of the new company, which was incorporated in Delaware and will have headquarters at 209 La Salle Street, Chicago. It will be financed by a group consisting of the Federal Securities Corporation, H. M. Byllesby & Company and others. Companies in the merger include the Illinois Public Utility Company, Wisconsin Public Utility Company, Lower Peninsula Power Company of Grand Rapids, Hoosier Public Utility Company of Indiana, Houghton County Electric Light Company of Michigan and the properties in Maine and New Brunswick whose acquisition by the Pierce interests was noted in the ELECTRICAL WORLD for April 3 (page 728). A gas company at Vincennes, Ind., and the Consolidated Water Company of New York State are also embraced.

Purchase by the Cleveland Electric Illuminating Company of the Grand River Electric Light & Power Company, the Suburban Utilities Company, the Northeastern Ohio Power & Light Company and the municipal power and light plant of Conneaut, Ohio, noted on March 13 (page 575) as under way, has been consummated.

The W. B. Foshay Company has acquired through purchase all of the properties of the Midland Power Company at a cash price of $90,000. These properties are in northwestern Minnesota, supplying the towns of Brooks, Mentor, McIntosh and Fosston. They are already interconnected with the lines of the Minnesota Electric Light & Power Company, one of the W. B. Foshay subsidiaries.

The entire capital stock of the Delton Electric Company, serving Delton and the territory adjoining Mirror Lake from the company's transmission line between Delton and Kilbourn, has been taken over by the Wisconsin Power & Light Company.

The municipal lighting plant at Brush, Col., will be sold to the Public Service Company of Colorado for $96,800 as the result of a public vote on April 6, which recorded 152 citizens for the sale and two opposed.

The International Paper Company of New York City has, according to Canadian dispatches, purchased the Hull Electric Company and the Hull Electric Railway Company from the Canadian Pacific Railway for $4,750,000. The purchase, of which official confirmation is yet lacking, would include a water-power plant at Deschenes, on the Ottawa River above Hull, as well as a power development of the Hull Electric Company at Paugan Falls on the Gatineau River. According to those in close touch with the situation, the International Paper Company is not particularly anxious to hold either the Hull Electric Railway or the lighting system, and it is believed that negotiations would be started between the company and the Ottawa Traction Company and the Ottawa, Light, Heat & Power Company with the object of transferring the Hull services to the Ottawa companies for amalgamation.

Briefer News

New England Power Company to Generate 45,000 Hp. at Bellows Falls, Vt.—Old mill buildings at Bellows Falls, Vt., belonging to the International Paper Company have been purchased by the New England Power Company and will be razed. The site is to be used for a power plant which will have an initial equipment rated at 45,000 hp. and be connected by 66-kv. transmission lines with the New England Power network.

Volta Centenary Celebration.—Great preparations are being made in Italy to commemorate next year in suitable form the centenary of the death of the Italian electrophysicist Alessandro Volta. All the leading scientific and technical associations are joining to organize a comprehensive program which will comprise, among other items, international congresses on physics, telegraph and radio communication.

Watertown (N. Y.) Municipal Bill Defeated.—An attempt to settle the long-standing trouble between the municipal government in Watertown, N. Y., and the Northern New York Utilities, Inc., by giving the city the power to sell surplus energy from its pumping plant to private customers was defeated in the New York State Senate this week, when a bill permitting such sale was lost. The Northern New York Utilities seeks a permanent injunction against this competition.

Westinghouse Company Plans All-Electric Homes.—The homes to be built in a housing development which the Westinghouse Electric & Manufacturing Company is undertaking in Forest Hills, a suburb of Pittsburgh, for its employees, are to have the most complete electrical equipment ever installed as standard design. This equipment will include electric heating as well as cooking apparatus, and it is expected that the results will show that in the Pittsburgh district it is possible to heat, cook and light or, in fact, do anything that is possible by coal or gas on a more economical basis.

New Turbo-Generator for Crawford Avenue Ordered.—Another turbo-generator unit has been ordered for the Crawford Avenue station of the Commonwealth Edison Company in Chicago. It will have a rating of 90,000 kw., larger than that of any existing generator, and will increase the installation at Crawford Avenue to 325,000 kw. The new machine will be a compound unit with two shafts. The high-pressure section will drive a 33,000-kw. main generator and a 2,000-kw. auxiliary generator. The low-pressure section, with a rating of 55,000 kw., will carry a directly connected exciter. Six

boilers will furnish steam at 600 lb. pressure and 250 deg. of superheat, developing, it is expected, a kilowatt-hour on 1½ lb. of coal.

Stanford University's Million-Vote Testing Set Shipped to Palo Alto.—Recent shipment from Pittsfield, Mass., of the million-vote experimental testing set made by the General Electric Company for Stanford University at Palo Alto, Cal., required four flat cars and one box car, and at Schenectady two more cars for parts manufactured there were added, including the motor-generator units. The six transformers shipped from Pittsfield weigh 45,000 lb. each.

Tippecanoe and Hydro Too.—The annual report of the Indiana Hydro-Electric Power Company describes the water-power plant at Oakdale, on the Tippecanoe River, which went into service not long ago as a sister plant to the one at Norway on the same historic stream. The Oakdale plant consists of three vertical turbo-generators having a combined capacity of 14,700 hp. A 66,000-volt transmission line connects it with Lafayette, Ind. The two plants, aside from their industrial importance, have added to the natural beauty of the Tippecanoe country. Above the Norway dam there is a body of water known as Shafer Lake, while another fine body of water stretches from the Oakdale dam to Monticello and is known as Freeman Lake. The developments at both plants utilize a total fall of 82 ft., 48 ft. at Oakdale and 34 ft. at Norway.

Thirty-eight Representatives Pass a Bill to Help "Illimitable, Costless Energy."—With only 70 of the 435 members of the House of Representatives in attendance, a bill known as the "Garabed illimitable, costless energy" bill was passed on April 5. The vote was 38 to 32. The bill as passed recognizes Garabed as the "first and original inventor" of the method of producing unlimited energy. The failure of Congress to include those words in a former resolution was advanced by Garabed as a reason for his refusal to make a demonstration before government officials. The first resolution precluded any sale or attempted sale of any interest in the invention pending the test before the officials, but no penalty was provided. The resolution just passed by the House supplies that omission by providing imprisonment for not less than three years for any such attempt.

Iowa State College to Study Radio Interference.—The engineering experiment station of Iowa State College has inaugurated an extensive investigation and study of the causes of radio interference. J. K. McNeely, research professor of electrical engineering, will supervise the study. The problem of the experimenters at Ames will be to classify the several causes of interference and determine the distance over which they are effective. Following this work an attempt will be made to discover methods of shielding the electric units to prevent trouble. The Attorney-General of Iowa is said to be pledged to draft a bill to make it a misdemeanor to sell, distribute or use any radio apparatus that will in the opinion of a legally appointed commission interfere with broadcast reception. It is understood that the engineering department of Iowa State College will be designated as such a commission.

California Cities Attack State Commission.—A plan is under way in 60 cities and towns of California either to make the California Railroad Commission an elective body or to abolish it, reverting to municipal control of utility companies. Mayor Davie of Oakland is said to be behind the move, and Los Angeles officials are also believed to back it. It is alleged that the commission has become an agency for protecting the interests of the corporations rather than the people. The fight is to be made at the session of the Legislature next January.

Shreveport and Texarkana to Be United by 132,000-Volt Line.—Construction will begin in less than a month on a 132,000-volt transmission line which the Southwestern Gas & Electric Company means to build between its generating plant now under construction at Shreveport, La., and Texarkana, Tex.-Ark. The preliminary work, including an aërial survey, has been completed. The line will utilize 225 miles of aluminum cable and 10,000 suspension-type insulators. It will be connected at Bloomburg, Tex., with the line of the East Texas Public Service Company. Three 10,000-kw. turbines, instead of the single unit at first contemplated, are to be installed at Arsenal Hill, Shreveport.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, Jan. 2, page 80.]

International Electrotechnical Commission—Engineering Societies Bldg., New York, April 13-22.

American Welding Society—New York, April 21-23. M. M. Kelly, 29 West 39th St., New York.

American Electrochemical Society—Chicago Beach Hotel, Chicago, April 22-24. C. G. Fink, Columbia University, New York.

Southeastern Water and Light Association—Hotel Casa Marina, Jacksonville Beach, Fla., April 27-29. W. F. Stieglitz, Columbia, S. C.

Southeastern Division, N. E. L. A.—Pinehurst, N. C., April 27-29. C. M. Kilian, 317 Hurt Bldg., Atlanta.

Nebraska Section, N. E. L. A.—Lincoln, April 29-30. H. M. Davis, Fraternity Bldg., Lincoln.

Missouri Association of Public Utilities—Springfield, Mo., May 2-4. F. D. Beardslee, 315 North 12th St., St. Louis.

American Institute of Electrical Engineers—Regional meetings: Madison, Wis., May 6-7, and Niagara Falls, N. Y., May 26-28. F. L. Hutchinson, 33 West 39th St., New York.

Electrical Manufacturers' Club—Hot Springs, Va., May 12-15. W. F. Field, Safety Cable Co., New York.

National Electric Light Association—Atlantic City, N. J., May 17-21. M. H. Aylesworth, 29 West 39th St., New York.

National Electrical Credit Association—New York, May 20-21. F. P. Vose, 1008 Marquette Bldg., Chicago.

Electric Power Club—The Homestead, Hot Springs, Va., May 23-27. S. N. Clarkson, Keith Bldg., Cleveland.

Diesel-Electric Ferryboats for New York City.—Six steel Diesel-propelled electric ferryboats will in the near future be operated exclusively for motor vehicle traffic across the Hudson River between the Twenty-third Street pier, New York, and the Erie Railroad terminals at Weehawken and Undercliff, N. J. Financing of the Electric Ferries, Inc., which is to carry out the undertaking, is now under way. The boats will be 155 ft. long by 48 ft. wide, with 8½-ft. draft, and each will accommodate about forty automobiles and five large passenger buses such as operate between New York City and suburban points in New Jersey.

Growing Power Load of Nevada-California Electric Corporation Plants.—Much satisfaction with the progress of the Nevada-California Electric Corporation in 1925 was expressed recently by J. Walker Hyer, vice-president International Trust Company, on his return to Denver, where the first-named company has headquarters, from an inspection trip taken with Edwin S. Kassler, president of the Nevada-California Electric. "There are ten modern and progressive little towns in the Imperial Valley—El Centro, Calexico, Brawley, Calipatria, Heber, Holtville, Imperial, Niland, Seeley and Westmoreland—all served with ice from the Imperial Ice & Development Company and with power from the Southern Sierras Power Company, both subsidiaries of the Nevada-California Electric Corporation," Mr. Hyer said. "The power development for these towns and the valley as a whole is from the Nevada-California hydro-electric plants in the Sierra Mountains, 250 miles north, and is brought down to them over power lines."

Water-Power Projects in Washington State.—Plans for a 10,000-hp. development on the Nasel River, which flows to the Pacific Ocean in the southern part of Washington State, are outlined by Henry L. Gray of Seattle in an application to the State Hydraulics Office for permission to appropriate 670 sec.-ft. Expenditure is put at $1,500,000. The dam contemplated will be 1,600 ft. in length and 110 ft. high. Two other projects for which filings have been made are in the northwestern corner of the state. One of these calls for the development of 11,600 continuous horsepower from Eagle Creek and the other for 3,600 hp. from Sapoel Creek, both streams flowing into Lake Crescent. W. E. Theodore of Seattle and Edward Fitzpatrick of Ovington are the applicants. In addition to these projects, L. W. Johnson of Tacoma wishes to use 700 sec.-ft. from the North Fork of the Snoqualmie River to produce 33,000 continuous horsepower. This project would cost $2,000,000, utilize a fall of 500 ft. and include a dam 50 ft. high and about 125 ft. long. The North Dallas Irrigation District of Portland, Ore., asks 300 sec.-ft. from the Klickitat to develop 2,400 hp. in the southwestern part of Washington at cost of $250,000.

Men of the Industry

Schwabe Heads New England Division, N.E.L.A.

Walter P. Schwabe was elected president of the New England Division of the National Electric Light Association at its annual meeting on Wednesday last in Boston. Mr. Schwabe has long been active in N.E.L.A. affairs and has been in the electrical industry for 33 years. He was born in New York in 1874 and entered the employ of the Rutherford (N.J.) Electric Light Company in 1893 as a central-station apprentice, rising to the post of superintendent and commercial agent for the Rutherford district of the Public Service Corporation of New Jersey when various mergers were consummated in

W. P. SCHWABE

that territory. In 1908 he was appointed general manager and superintendent of the Northern Connecticut Light & Power Company, and in 1913 he was made vice-president with headquarters at Thompsonville. In 1925 he became president and now heads the Northern Connecticut Power Company, a group of public utilities embracing electric, gas and water service in this territory under the general management of the White interests of New York. Mr. Schwabe is a member of many national engineering, scientific and local organizations. He has written frequently for the ELECTRICAL WORLD, has appeared as an expert witness in appraisal and damage cases of public utility interest and has a well-deserved reputation among Northeastern executives for his work in public relations, customer ownership and utility economics.

W. D. McElhinny, formerly sales manager of the "frigidaire" commercial division of the Delco Light Company, has just been appointed vice-president in charge of sales of Copeland Products, Inc.

Byrd M. Latham, vice-president and operating executive of the Pinellas County Power Company and supervisor of other Florida properties of Fitkin Utilities, Inc., has curtailed his activities in the public utility field in Florida. While he will remain as vice-president of the Pinellas County Power Company and consulting supervisor, he will relinquish active managerial work in the field. Mr. Latham has been an outstanding figure in directing the company's active program of expansion in Florida.

Moritz Rosenthal of Ladenburg, Thalmann & Company, bankers, has been elected chairman of the board of directors of the Philadelphia Company and of the Duquesne Light Company.

William P. Wallace has become active manager of the Pinellas County Power Company, St. Petersburg, Fla., a subsidiary of the General Engineering & Management Corporation. Mr. Wallace joined the General Engineering organization after a successful association of nineteen years as vice-president and general manager of the Toledo Edison Company, until 1924 known as the Defiance Gas & Electric Company. He is thoroughly conversant with public utility work, his experience having included design, construction, operation and management.

R. J. Throckmorton, formerly of Richmond, Va., and more recently superintendent of light and power for the Norfolk district, has been appointed general superintendent of light and power for the system of the Virginia Electric & Power Company. Mr. Throckmorton will have general supervision over all operating departments of the light and power system except the production and transmission departments. His headquarters will be established at Richmond. **R. L. Gill**, formerly superintendent of the Suffolk district, has been appointed light and power superintendent for the Norfolk district to succeed Mr. Throckmorton with jurisdiction over the Norfolk, Portsmouth and Suffolk divisions. **W. F. Fairlamb**, formerly of Richmond, has been appointed superintendent of the Suffolk division.

J. A. Hale Chief Engineer of Utah Power & Light

J. A. Hale, who was appointed chief engineer of the Utah Power & Light Company to succeed Markham Cheever, as announced in a recent number of

J. A. HALE

the ELECTRICAL WORLD, joined the staff of that organization in 1913, and during his entire period of service his activities have been with the engineering department of the company. He was born in Roanoke, Va., in 1888 and during his early life was employed for a number of years in the construction department of the Norfolk & Western Railroad in Virginia and West Virginia. He was graduated from the Virginia Polytechnic Institute in 1911.

J. B. Hill to Assume New Duties with United Light Organization

J. B. Hill, who has been vice-president and general manager of the Lincoln (Neb.) Gas & Electric Light Company for several years, will soon take over important managerial work for the United Light & Railways Company, Davenport, Iowa, which recently acquired the Lincoln properties. Prior to

J. B. HILL

his connection in Lincoln Mr. Hill had served on the electrical engineering faculty of the University of Iowa for fourteen years, during which time he built up an extensive consulting practice among utilities of the Middle West. Formerly he had been affiliated with the Union Electric Light & Power Company of St. Louis, the United States Steel Corporation at Eveleth, Minn., and the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., and Memphis, Tenn. Mr. Hill's contributions to the progress of the Lincoln properties were so obvious that the new management considered him well qualified to direct the operation of extensive electric and gas plants. He has been active in the Nebraska Section of the National Electric Light Association and is at the present time serving as its president.

J. P. T. Kenyon has been named assistant engineer of purchases of the New York Edison Company.

Charles H. Peirson and **W. H. Fischer** have been appointed assistant vice-presidents of the Southern California Edison Company, according to an announcement made by R. H. Ballard, executive vice-president and general manager. Mr. Peirson entered the employ of the Edison Electric Company, predecessor of the present organization, about twenty years ago as advertising manager after long experience in

editorial and executive positions in the general offices of the Associated Press in New York City and with metropolitan papers in the East. He is the originator of the Edison plan of display advertising, which has been very generally adopted and standardized by the larger public utilities of the country. Mr. Fischer has a background of many years' experience in newspaper work and for some time past has been manager of the "greater service" department of the Southern California Company.

Thomas N. McCarter, president of the Public Service Corporation of New Jersey, has been elected a director of the United Gas Improvement Company to succeed the late Randal Morgan. Directors of the Public Service Electric & Gas Company have announced the election of **Richard R. Young** as vice-president in charge of sales.

Samuel G. Hibben has been placed in charge of the combined engineering and illumination departments of the Westinghouse Lamp Company. Under his supervision will be grouped the commercial engineering department and the illumination bureau, the consolidated activities to be known as a new commercial engineering department. This reorganization has been announced as necessary in affording a broader and more direct service in regard to "Mazda" lamp applications, and Mr. Hibben, while retaining the title of illuminating engineer, will now have under his direction many allied matters such as lamp performance and special lighting developments.

C. P. Osborne, formerly superintendent of light and power for the Portland (Ore.) Electric Power Company, has been named general superintendent, and **R. R. Robley,** formerly operating engineer, has been named superintendent of operation. **C. P. Dunn,** formerly designing engineer, has been promoted to be chief engineer, with his duties expanded to include supervision of the testing, right-of-way and assistant engineers, in addition to his former supervision of all the draftsmen and the engineers assigned to construction.

F. H. Brooks New President of Middle West Division, N.E.L.A.

Frank H. Brooks, vice-president and general manager of the Continental Gas & Electric Corporation (a subsidiary of the United Light & Power Company), has been elected president of the Middle West Geographic Division of the National Electric Light Association. He has been with the Continental corporation since its inception in 1913, first as district manager of its Iowa properties and recently in his present capacity in charge of the Iowa Service Company, Nebraska Gas & Electric Company, Maryville (Mo.) Electric Light & Power Company and as vice-president of the Lincoln Gas & Electric Light Company.

Starting in the street-railway field at Erie, Pa., in 1894, Mr. Brooks went in 1896 to upper Michigan, where for six years he served as electrical engineer of the Peninsular Electric Light & Power Company, Houghton, in aiding the development of its hydro-electric

F. H. BROOKS

plants and long-distance transmission of power. For the next three years he was general manager of the Vicksburg (Miss.) Railway & Light Company. In 1905 Mr. Brooks went to Lincoln, Neb., as manager of the Lincoln Traction Company. For nearly nine years he was closely identified with the building of this company's property and took a very active part in the inauguration of its light and power business. In the course of his experience Mr. Brooks became a strong advocate of interconnection through the development of large efficient power plants and high-voltage lines, and he has made a special study of this service as applied to such communities as are served by the company he represents.

Obituary

Harold Gould Northrup, formerly vice-president of the Spotsylvania Power Company, Fredericksburg, Va., died at the home of his daughter in Bronxville, N. Y., April 10, following a short illness. Mr. Northrup was 72 years of age.

Howard Knowles, some years ago president of the public utility properties at Galesburg, Ill., died March 28 at the Galesburg Cottage Hospital, in his seventy-ninth year. In recent years Mr. Knowles had been vice-president and director of the First National Bank in Galesburg.

George J. Murphy, for many years treasurer of the Pettingell-Andrews Company, Boston, and one of the best-known electrical credit men in New England, died at his home in Newton Center April 12, following several months of ill health. He was born at Abington, Mass., in 1883, and had served the Pettingell-Andrews Company for nearly a quarter of a century. He was personally interested in a number of public utility developments in the Northeastern electrical territory.

Chester W. Lyman, formerly vice-president of the International Paper Company, died April 7 in the Massachusetts General Hospital in Boston in his sixty-fourth year. Mr. Lyman was most widely known for his activities in the paper-manufacturing industry, but his interests were by no means confined to this field of endeavor. Special studies which he made in electricity won for him the degree of M.A. from Yale University in 1895. Mr. Lyman was a member of the American Institute of Electrical Engineers, the American Paper & Pulp Association and many other organizations.

Julius C. Tournier, who had a longer service record than any other employee of the General Electric Company, died in Schenectady on April 6. On June 1 he would have completed 45 years' service with the company. Mr. Tournier was born in Ansac, France. In 1881 he was employed by Thomas A. Edison as an instrument maker at Menlo Park. In October, 1891, Mr. Tournier, then with the Edison Machine Works in New York City, removed to Schenectady to continue his experimental work in the wiring supplies department. He originated many of the earliest forms of wiring devices, notable among which was the key socket. He was also responsible for the change from glass fuse plugs to plugs of porcelain construction.

Louis A. Herdt, professor of electrical engineering at McGill University as a vice-president of the Montreal Tramways Commission, was found dead in his office in the McGill Engineering Building April 11. He had been in ill health for more than a year. A native of Trouville, France, Professor Herdt removed to Canada at an early age and was educated at McGill University. Later he served on the staff as demonstrator in electrical engineering, lecturer, assistant professor, associate professor and head of the department. Dr. Herdt was a fellow of the American Institute of Electrical Engineers, president of the Electrical Service Commission of Montreal and a member of the Engineering Institute of Canada. In 1907 he was a delegate to the International Electrotechnical Commission meeting in London, England.

John H. Lucas, consulting counsel of the Kansas City (Mo.) Power & Light Company, died March 19 after a two weeks' illness. He had been associated with the electrical properties in Kansas City for the past 23 years. In 1925 on account of his failing health he was succeeded as general counsel by his son, William C. Lucas, and at that time Judge Lucas was appointed consulting counsel, in which capacity he acted until the time of his death.

William Cooper, British consulting engineer and electrochemist, died March 18 in London, England. Mr. Cooper taught under the late Prof. W. E. Ayrton at the London Technical College for three years and later he joined the staff of James Swinburne, subsequently becoming a partner in the firm of Swinburne, Cooper & Baillie, consulting engineers. For thirteen years he was editor of the *Electrician* and for three years of *Science Abstracts.* Mr. Cooper, who was 58 years of age, had served on the council of the British Institution of Electrical Engineers, was a vice-president of the Faraday Society, honorary treasurer of the Physical Society, a member of the electroculture committee of the British Board of Agriculture and of the Conjoint Board of Scientific Societies. He was the author of numerous books, papers and contributions to the press and was regarded as an authority on the subject of primary cells.

Recent Court Decisions

Utility Alleging Confiscation May Resort at Once to Federal Courts.—The United States District Court in Missouri found, in Springfield Gas & Electric Company vs. Public Service Commission of Missouri, that a rate order protested against was confiscatory because it did not permit a clear return of 8 per cent on the valuation. In so doing the court overruled a contention put forth by the defendant that it was without jurisdiction because the plaintiff had not exhausted its remedy in state courts. The company, said the court, was entitled to apply immediately to the federal bench for relief. (10 Fed. (2) 252.)*

Relation of Drunkenness to Contributory Negligence.—In Shearer vs. Niagara Falls Power Company the defendant resisted compensation to the heirs of the plaintiff, who lost his life by falling from a girder on which he was at work for the company, the allegation being made that he was drunk and lost his balance for this reason. The Court of Appeals of New York remitted the case to the State Industrial Board with instructions to base their finding on the question, Did the death of Shearer result solely from his intoxication while on duty? An affirmative answer would preclude the recovery of compensation. (150 N. E. 604.)

Right to Maintain Transformer Station in Business District Sustained.—The Fifth Avenue Association and property owners on West Forty-seventh Street and West Forty-eighth Street, New York, have lost a suit begun two years ago to prevent the New York Edison Company from erecting and maintaining a transformer station on the streets named (Taylor vs. New York Edison Company). The company applied in 1924 for permission to erect the building, but after the superintendent of buildings had granted permission the board of appeals of the Building Department reversed his ruling on the ground that the building was barred under a provision of the zoning law prohibiting erection in a business district of a "central power station." The Edison company maintained that the building was not a power station but merely one of forty substations maintained throughout the city to which electric power is transmitted from the central stations along the waterfront and converted into energy distributed directly to users. The board of appeals then gave permission for the building, and the company erected, at a cost exceeding $1,900,000, a three-story and basement structure, in keeping with the other business buildings in the neighborhood, with stores and showrooms on the street level. The company maintained that such transformer stations are necessary and that the custom is to build them in the "load center" of the districts served. The plaintiff contended that the transformer station created a "dead spot," because it brought no trade into the high-class business district in which it was erected. The court ruled that the transformer station does not conflict with the law, because it is not a central power station, and that its use does not make it offensive to the neighborhood.

Responsibility of Maker of Repairs to Employees of Company Entering Into Contract with Him.—One under contract with an electric railway company simply to repair the company's high-tension electric wires along its railway lines is under no duty thereby to make changes in the location of such wires or to cover them with insulation or boxes for the protection of the railway company's employees on the premises engaged in work incident to their employment, and such a contractor cannot be made to respond in damages to such employees injured by coming in contact with the wires. So holding in Mozingo vs. Wellsburg Electric Light, Heat & Power Company et al., the Supreme Court of Appeals of West Virginia reversed a judgment for the plaintiff as against one of the defendants, the Brooke Electric Company, which, it was testified, "had charge of repairs." Undertaking repairs, the court said, did not mean reconstruction of the kind which plaintiff testified would have been necessary to make the wires safe. (131 S.E. 717.)

Constitutionality of Recapture Provision of Wisconsin Water-Power Law.—The constitutionality of the recapture clause of the Wisconsin water-power law, under which the state has the right to take over private water-power properties at the expiration of 30 years at a price to be fixed by the Railroad Commission, has been upheld by the Wisconsin Supreme Court, which has affirmed a previous lower court ruling denying the Fox River Paper Company authority to rebuild its power dam at Appleton because the company's application did not contain consent to that part of the recapture clause making the granting of water-power rights by the state conditional on the willingness of the owner to live up to the provisions of the clause (see ELECTRICAL WORLD for Dec. 26, 1925, page 1329). The case dates back to the early days of water-power development in Wisconsin. The paper company owns a dam which was built across the Fox River at Appleton in 1878 without legislative authority. The dam is now considered obsolete, and an application was made to the commission on May 21, 1925, for a certificate authorizing its rebuilding. This application was denied by the commission because it lacked consent to the recapture clause. The company challenged the constitutionality of the law on the ground that it is confiscatory. Answering the arguments voiced by attorneys of the water-power interests concerning the competency of the Legislature to require the owner of water power to abdicate his right to just compensation on a future taking, the state contended that the recapture provision does not constitute taking without just compensation.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Change in Rates to a Room Basis Sanctioned Despite Increase in Some Bills.—The Tomah Electric Company was allowed by the Wisconsin Railroad Commission to substitute a schedule reducing the primary and secondary rates for commercial lighting and for residence lighting, and making the residence charge dependent on the number of rooms, which schedule materially reduced the total revenue, even though in some instances bills would be increased, where the increases were caused by the fact that the customers had a large installation coupled with a small use of energy.

Commission Will Not Interfere with Excessive Price for Property but Will Exclude It from Rate Base.—Declaring that it would not arbitrarily interfere with a transfer of utility property, nor intervene as to the price paid by parties competent to contract who desire to pay excess prices, nor deny to the seller the benefit of his contract, the Missouri Public Service Commission granted the joint application of the Mountain Grove Creamery, Ice & Electric Company and the Missouri Electric Power Company that acquisition of the former by the latter should be approved. The commission, however, believing the price to be excessive, decreed that the excess paid over market value should not be charged to plant account or allowed as against the public in a valuation for rates.

New Jersey Commission Disapproves Non-Voting Stock.—The creation of voting trusts in which certain favored stockholders control companies to the exclusion of other security owners was condemned in a decision by the New Jersey Board of Public Utility Commissioners when it refused approval of a stock issue of the Delaware & New Jersey Transportation Company the great majority of which would have been non-voting. The company applied for permission to issue $200,000 worth of 7 per cent non-voting preferred stock, 2,000 shares of non-voting common stock and 2,500 shares of common voting stock. The last class of securities would have been given in exchange for a transportation business already established, while the first two classes would have been used to pay off the debts of the concern and the purchase of new equipment. In its decision the utility board followed the recent ruling of the Interstate Commerce Commission in the Nickel Plate consolidation, when it was held that it would be inimical to the public interest to strip stockholders of voting power, thereby rendering easy control of a railroad company by a comparatively limited amount of investment. Although the proposal to issue the securities is in accordance with the New Jersey corporation act, the board stated that the courts have held it within the power of the commission to pass not only upon the legality of financial propositions of utility companies, but upon their merits from the standpoint of a wise public policy.

Financial and Corporate

Utility Market Irregular

In Period of Alternate Gains and Losses Utilities Generally Drop Back in Position

ALTHOUGH the market for stocks generally was comparatively quiet during the week under review, further liquidation occurred on last Saturday and Monday, driving numerous issues to new low levels for the year. Reports of a run on banks in Cuba brought a temporary flurry in the rate on call money here as a result of the calling of loans in response to a request for aid from the island. It was reckoned that something like $40,000,000 or $50,000,000 had been taken from the bank here, but call money on Monday did not exceed 5½ per cent and the matter was not viewed with alarm in well-informed circles. In the Monday decline General Electric lost another ten points in its fall to 292, at which level it is, incidentally, a hundred points roughly below the level at the 1926 peak. American Waterworks & Electric Company's stock on the same day fell to 45, a new low for the year, and ground was lost by such other utilities on the New York Stock Exchange as North American.

Among the utility stocks traded in over the counter and on the New York curb market American Light & Traction was, perhaps, the heaviest loser, that issue having fallen ten points during the week. Losses of about four points each during the week were suffered by such stocks as American Power & Light, Electric Bond & Share Securities Corporation, Electric Investors, Inc., Middle West Utilities, United Gas Improvement and United Light & Power class A stock.

Most of the gains for the week occurred in the preferred stocks, but substantial improvement was nevertheless recorded in the common stocks of Columbus Electric & Power, Tampa Electric and Commonwealth Edison.

New Capital Issue

The Central Gas & Electric Company during the past week made an offering of first lien collateral trust sinking-fund gold bonds to the amount of $6,500,000, the price being 98½ and accrued interest to yield about 6.15 per cent. The proceeds from the sale of these bonds and other securities will provide funds to retire present outstanding securities, for the acquisition of property and for other corporate purposes. These bonds, bearing interest at the rate of 6 per cent, were dated March 1, 1926, and mature March 1, 1946. The Central Gas & Electric Company, a Delaware corporation, will furnish, through operating properties, public utility service in various communities of Illinois, Wisconsin, Michigan, Indiana, Maine, New York and New Brunswick, comprising a population of approximately 300,000.

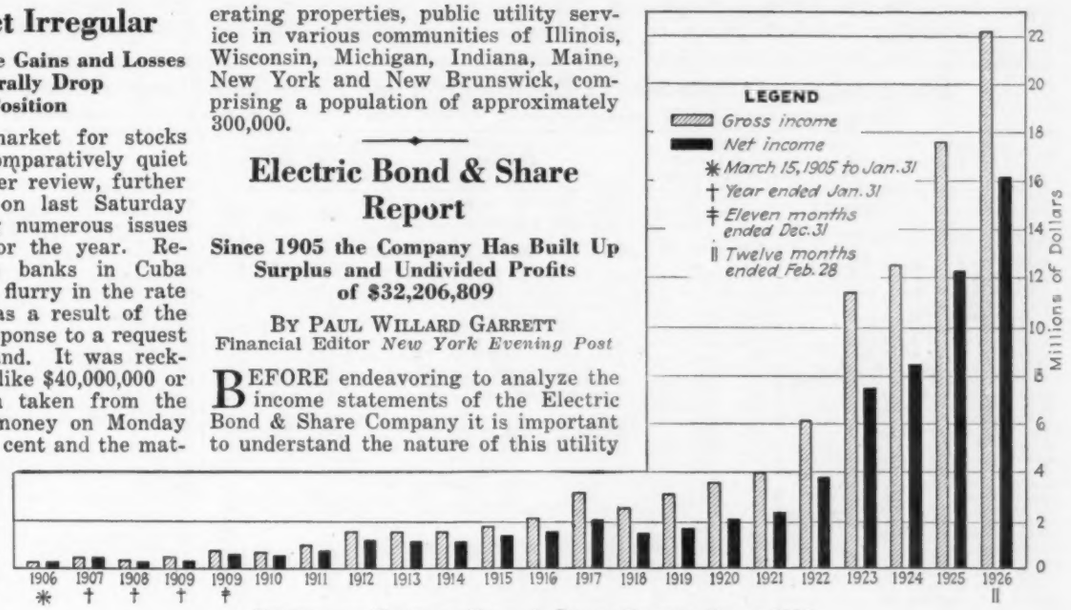
Electric Bond & Share Report

Since 1905 the Company Has Built Up Surplus and Undivided Profits of $32,206,809

BY PAUL WILLARD GARRETT
Financial Editor *New York Evening Post*

BEFORE endeavoring to analyze the income statements of the Electric Bond & Share Company it is important to understand the nature of this utility organization—unique in some degree, since in the strict sense it is neither an operating company nor a holding company as those terms usually are used. Affiliated with the Electric Bond & Share Company are numerous operating and holding companies, of course, but Bond & Share does not own a majority of the common shares in the utilities that belong in its group. Dividends from stocks of various companies make up a substantial portion of the Electric Bond & Share revenues, but, contrary to general supposition, that source of revenue is no more important than the supervision agreements under which for a stipulated fee the company gives every type of expert assistance imaginable. All of which will make it plain that in studying an income statement of the Electric Bond & Share Company the reader is not studying a consolidated statement of all companies in the group such as those which frequently are put out by large holding companies.

Since the Electric Bond & Share Company was organized in 1905 annual gross earnings have grown from a quarter of a million dollars to many mil-



GROWTH IN ELECTRIC BOND & SHARE INCOME SINCE 1905

Dividends Declared

The quarterly dividends listed below were recently announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Abitibi Power & Paper, com	$1	Apr. 20
Allis-Chalmers Mfg., com	$1.50	May 15
American Light & Trac., com	2	May 1
American Lt. & Trac., com. (extra)	2	May 1
American Light & Traction, pf.	1¼	May 1
Associated Gas & Elec., com., A	.62½	May 1
Babcock & Wilcox	1½	July 1
Babcock & Wilcox	1½	Oct. 1
Babcock & Wilcox	1½	Jan. 2'27
Babcock & Wilcox	1½	Apr. 1'27
Bangor Hydro-Elec., com	1½	May 1
Brazilian Trac., Lt. & Power, com.	1½	June 1
Canada Northern Power, pf	1¾	Apr. 15
Cape Breton Electric, pf	3	May 1
Cleveland Elec. Illg., com	2½	Apr. 15
Cleveland Elec. Illg., pf	1¾	June 1
Commonwealth Edison	2	May 1
Dominion Power & Trans., pf.	3½	Apr. 15
Eastern States Power, pf	$1.75	May 1
Edison Elec. Illg., Boston	3	May 1
Edison Electric Illg., Brockton	.62½	May 1
Fort Worth Power & Lt., pf	1¾	May 1
Havana Electric Ry., Light & Power com. & pf	3	May 15
Havana Electric & Util., 1st pf.	$3	May 17
Internat. Utilities, com. A	.87½	Apr. 15
Internat. Utilities, pf	$1.75	May 1
Lowell Electric Light	.62½	May 1
Milwaukee Elec. Ry. & Lt., pf	1¾	Apr. 30
Northwestern Electric, 1st pf	1¾	Apr. 1
Northwestern Electric, pf	1¾	Apr. 1
Ohio Edison, 6% pf	$1.50	June 1
Ohio Edison, 6.6% pf	$1.65	June 1
Ohio Edison, 7% pf	$1.75	June 1
Ohio Edison, 6 6% pf*	.55	Apr. 1
Ohio Edison, 6.6% pf.*	.55	May 1
Ohio Edison, 6.6% pf.*	.55	June 1
Ottawa-Montreal Power, pf	1¾	Apr. 15
Power Corp. of Canada, pf	1¾	Apr. 15
Public Service Corp. of N. J., com	$1.25	Mar. 31
Public Service Corp. of N. J., 8% pf.	2	Mar. 31
Public Service Corp. of N. J., 7% pf.	1¾	Mar. 31
Public Service Corp. of N. J., 6% pf.	1½	Mar. 31
Pub. Service Co. of No. Ill., 6% pf	$1.50	May 1
Pub. Service Co. of No. Ill., 7% pf	$1.75	May 1
Pub. Service Co. of No. Ill., com	$2	May 1
Pub. Service Co. of No. Ill., com.	$2	May 1
Public Service Elec. Pwr., pf.	1¾	May 1
Republic Railway & Light, pf.	1¾	Apr. 20
San Diego Cons. Gas & Elec., pf.	1¾	Apr. 15
Southern Canada Power	1	May 15
Southern Colorado Power, com., A	.50	May 25
Southern Wisconsin Elec., pf	1¾	Apr. 15
Tenn. Electric Power, 6% pf	$1.50	July 1
Tenn. Electric Power, 7% pf	$1.75	July 1
Tenn. Electric Power, 7.2% pf.	$1.80	July 1
Tenn. Electric Power, 6% pf.*	.50	May 1
Tenn. Electric Power, 6% pf.*	.50	June 1
Tenn. Electric Power, 6% pf.*	.50	July 1
Tenn. Electric Power, 7.2% pf.*	.60	May 1
Tenn. Electric Powr, 7.2% pf.*	.60	June 1
Tenn. Electric Power, 7.2% pf.*	.60	June 15

* Monthly.

lions. Gross income has risen steadily, reaching $17,620,497 during the calendar year ended Dec. 31, 1925, but it is now learned that during the twelve months ended Feb. 28, 1926, gross income reached a new record high of $22,194,655. Net income in the same period has grown from a comparatively small figure to $16,164,399. Surplus and undivided profits had grown on Feb. 28, 1926, to $32,206,808 from a surplus of $440,599 on March 15, 1905.

It will be understood, of course, that there are seven and two-tenths times as many shares of stock of the Electric Bond & Share Securities Corporation, which is the issue traded in the market, as there are shares of the Electric Bond & Share Company, of which the common shares are on deposit with the Electric Bond & Share Securities Corporation. Earnings of the Electric Bond & Share Company applicable to the common stock for the year ended Dec. 31, 1925, were equal to $5.99 a share on the stock of the Electric Bond & Share Securities Corporation, but during the twelve months ended Feb. 28, 1926, the earnings applicable to the latter stock equaled $8.14 a share.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday April 10	Low 1926	High 1926
STOCKS			
ABITIBI PWR. & PAPER, com. —no par	k 76¼	71¼	84¼
Adirondack Pwr. & Lt.—7% pf.	k102	....	....
Adirondack Pwr. & Lt.—8% pf.	108	108	110
Adirondack Pwr. & Lt., com.—50	m 75	n 31	n 98
Ala. Pwr., pf.	k103	....	....
Allis-Chalmers Mfg. pf.	106½	105½	110
Allis-Chalmers Mfg., com.	k 81¼	78¼	94½
Aluminum Co. of Amer., com.	k 64¼	54¼	76
Aluminum Co. of Amer. new, pf.	k 93	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m108	108	131
Amer. & Foreign Pwr., 7% pf.—no par	k 91½	89	98
Amer. & Foreign Pwr., com.—no par	k 19	18½	42½
Amer. Bosch Magneto, com—no par	k 20½	19½	34½
Amer. Brown Boveri, Elec.	k 32½	30½	48½
Amer. Brown Boveri Elec. pf.	89½	86½	97½
Amer. Elec. pwr., pf.	c111	101½	111½
Amer. Gas & Elec., 6% pf.—no par	k 90½	90½	95½
Amer. Gas & Elec., com.—no par	k 71	64	99½
Amer. Lt. & Trac., 6% pf.	105	114½	115½
Amer. Lt. & Trac., com.	k207½	195	263
Amer. Pwr. & Lt., 6% pf.	k 93½	92	94
Amer. Pwr. & Lt., com.—no par	k 51	48½	79½
Amer. Pub. Serv., 7% pf.	k 97	....	....
Amer. Pub. Serv., com.	47	45	80
Amer. Pub. Utilities, 4% pf.	k 86	....	....
Amer. Pub. Utilities, 6% pf.	86	85	86
Amer. Pub. Utilities, 7% pf.	m 90	....	....
Amer. Pub. Utilities, com.	m 78	80	82
Amer. States Sec., A	k 2½	....	....
Amer. States Sec. B	k 1	....	....
Amer. Superpwr., pf.—25	24½	23	26½
Amer. Superpower, pf.	90	90	94
Amer. Superpwr., Class A—no par.	k 21½	19½	37
Amer. Superpwr., Class B—no par.	k 23½	21½	39
Amer. Wtr. Wks. & Elec., 7% pf.	102½	101½	108½
Amer. Wtr. Wks. & Elec., com.—20.	k 47	45	74
Anaconda Copper	k 43	41½	51
Appalachian Pwr., 7% pf.	100	99	101
Appalachian Pwr., 1st pf., 7%.	102	99	101
Appalachian Pwr., com.	80	80	83
Arizona Pwr., 7% pf.	k 76	....	....
Arizona Pwr., com.	m 27	27	35½
Arkansas Cent. Pwr., pf., $7—no par	102	99	102
Arkansas Lt. & Pwr., 7% pf.	k 95	....	....
Arkansas Lt. & Pwr., com.	100	110	115
Asheville Pwr. & Lt., 7% pf.	l102½	100½	104
Assoc. G.&E., pf.—$3.50—50	k 50½	....	....
Assoc. Gas & Elec., pf.—$6—no par	k 80	....	....
Assoc. Gas & Elec., Class A—no par	k 29½	25½	35½
BABCOCK & WILCOX, com.	k128	....	....
Binghamton Lt., Ht. & Pwr., pf.	105	....	....
Birmingham Elec. pf.—$7—no par	100	101	103½
Blackstone Valley Gas & Elec., pf.	95	102	106
Blackstone Valley G.&E., com.—50.	92	....	....
Blaw-Knox, com.	d 48	45	56
Brazilian Trac., Lt. & Pwr., com.	f 90½	....	....
Broad River Pwr., pf.	k 93	....	....
Brooklyn Edison, com.	k136½	133	146½
Buffalo Gen. Elec., com.—no par	m 58	n 50	n 77
Buffalo, Niagara & East. Pwr., pf.—25	k 24½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par	k 25½	....	....
CALIFORNIA ELEC. GENERATING, pf.	90	89	93
California Ry. & Pwr., pf.	100	88	115
Carolina Pwr. & Lt., pf.—$7—no par	103	104	107
Carolina Pwr. & Lt., com.	m420	n290	n456½
Cent. & S. W. Ut. 7% pf.—no par	95	89½	95
Cent. & S. W. Ut., pr. ln. pf.—no par	97	95½	100
Central Ariz. Lt. & Pwr., pf.	102	....	....
Central Ark. Ry. & Lt., 7% pf.	k 98	....	....
Central Ill. Pub. Serv., 6% pf.	88	89	91
Central Ind. Pwr., 7% pf.	88	88	93½
Central Pwr. & Lt., pf.	95	95	98½
Central States Elec., 7% pf.	k 70	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	b115	110	115
Chicago Fuse Mfg., com., no par.	m 31½	30½	35
Cincinnati Gas & Elec., com.	g 90½	88	95
Cities Service, 6% pf.	k 83½	....	....
Cities Service, pf. B—10.	k 7½	....	....
Cities Service, pf. BB—100.	k 74	....	....
Cities Service, com.—20.	k 40½	....	....
Cities Service, Bks. Shrs.—10.	k 20½	....	....
Clarion River Pwr., pf.	93	93	95
Cleveland Elec. Ilu., 6% pf.	104	103	105½
Cleveland Elec. Ilu., com.	k240	....	....
Colorado Pwr., 7% pf.	k 96	....	....
Columbia Gas & Elec., 7% pf.	k113	112	115
Columbia Gas & E., com.—no par.	k 74½	63½	90
Columbia Ry., Gas & Elec., 6% pf.	95	95	96
Columbus Elec. & Pwr., 2d pf.	k102	....	....
Columbus Elec. & Pwr., com.	k150	....	....
Columbus Ry., Pwr. & Lt., 1st. pf.	97	98	99
Columbus Ry., Pwr. & Lt., pf. B.	92	92	95
Col. Ry., Pwr. & Lt., com.—no par.	82	82	85
Commonwealth Edison, com.	a140½	139½	144
Commonwealth Pwr., 6% pf.	k 86	82	87½
Commonwealth Pwr., com—no par.	k 33½	28½	42½
Conn. Lt. & Pwr., 8% pf.	116	117	121
Conn. Lt. & Pwr., 7% pf.	108	108	113
Cons. Gas of N. Y., pf.—50.	k 57	....	....
Cons. Gas of N.Y., com.—no par.	k 91½	87	104½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	e 102	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti 6½% pf.	c109½	108½	110
Cons. Gas, Elec. Lt. & Pwr. of Balti.. 7% pf.	e112	109	115½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	c127½	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par	e 50½	45	57½
Cons. Utilities of Dela., 7% pf.	m 85	n 80	n 84
Consumers Pwr., 6% pf.	95½	95	98
Consumers Pwr., 6.6% pf.	102	101½	103½
Continental Gas & Elec., 7% pfc. pf	k 95½	....	....
Continental Gas & Elec., 7% pr. pf.	k 93½	....	....
Continental G.&E., com.—no par.	95	85	150
Crocker Wheeler, com.	14	14	19
Crocker Wheeler, pf.	50	50	55
DALLAS PWR. & LT., 7% pf.	102	102	104
Dayton Pwr. & Lt., 6% pf.	98	95	97
Dayton Pwr. & Lt., com.	m420	n180	n460
Detroit Edison, com.	k126	123½	141½
Dubilier Condenser & Radio, com. no par	k 5½	5½	11
Dubuque Elec., 6% pf.	95	93	97
Duquesne Lt., 7% pf.	k113½	111½	114
EAST, N. Y. UTIL, pf.	85	....	....
Eastern New York Util., com.	75	....	....
Eastern States Power, com.	16	23	32½
Eastern States Pwr., pf.—$7—no par	k 87	....	....
Eastern Tex. Elec., 7% pf.	k102	....	....
East. Tex. Elec., com.—no par.	102	103	107
Edison Elec. Illum. of Boston, com.	d216	207	250
E. Paso Elec., com.—no par	k 80	....	....
E. Paso Elec. pf.	101	102	104
Elec. Bond & Share, 6% pf.	l105½	103½	107½
E. Bd. & Share Sec., com.—no par.	l 65	56½	86
El. Household Util., com—10.	a 20	16½	25
Elec. Investors, 6% pf.—no par.	89	92	95
Elec. Investors, com.—no par	k 37½	30½	74½
Elec. Investors, 10% pd. receipts	17	....	....
Elec. Pwr. & Lt., ctfs., pf.	k 93	89½	97½
Elec. Pwr. & Lt., ctfs., 40% pd.	102½	99½	115
Elec. Pwr. & Lt., ctfs. full pd.	104	105	110½
Elec. Pwr. & Lt., ctfs., com.—no par	k 19	17½	34½
Elec. Ry. Securities, com.—no par.	k 5½	4½	10
Elec. Refrig.	k 62½	52½	90½
Elec. Storage Battery, com.—no par.	k 77	71½	79½
Elmira Wtr., Lt. & R. R., 7% pf.	97	97½	99½
Emerson Elec. pf.	m102½	100	104½
Empire Dist. Elec., 6% pf.	80	80	85
Empire Pwr., A.	k 24½	23½	32
Eng. Pub. Serv., pf.—no par	k 99½	97	104½
Engr. Pub. Serv., com.—no par.	k 22½	21	29½
Eureka Vac. Cleaner, com.—no par.	k 46½	45	53½
FAIRBANKS MORSE, com—no par	k 49½	46	59½
Fairbanks Morse, pf.	115	108½	115
Federal Lt. & Trac., com.	k 30	28	39½
Federal Light & Traction, pf.	87	87	89
Federal Utilities, pf.	k 75	....	....
Federal Utilities, com.	k 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l105½	105	108
GALVESTON-HOUSTON ELEC., 6% pf.	k 50	....	....
Galveston-Hstn El., com.	k 18	....	....
Gen. Elec., com.	k295½	286	386½
Gen. Elec., special—10.	k 11½	11	11½
Gen. G.&E., (Del.) com. A no par.	k 37½	34	59
Gen. G.&E., (Del.) com. B no par.	k 28	....	....
Gen. G.&E., (Del.) A pf. $8—no par	106½	105½	110½
Gen. G.&E., (Del.) A pf. $7—no par	k 96	95½	99½
Gen. G.&E., (Del.) B pf.	95	93½	96
General Public Service, pf.	100½	100	106½
General Public Service, com.	13	12½	16½
Ga. Lt., Pwr & Rys., 6% pf.	m 82	82	85
Ga. Lt., Pwr. & Rys., com.	m 57½	56½	73½
Ga. Ry. & Elec., 5% pf.	m 70	n 78	n 84
Ga. Ry. & Elec., com.	k110	n115½	n115½
Ga. Ry. & Pwr., 8% pf.	112	112	114
Ga. Ry. & Pwr., 7% pf.	100	101½	103
Ga. Ry. & Pwr., 4% pf.	m133	....	....
Ga. Ry. & Pwr., com.	k110	....	....
Gt. Western Pwr., 7% pf.	h100½	....	....
HAVANA ELEC. UTIL., com.	41½	41½	44½
Havana Elec. Util., pf.	m 69½	67	71½
IDAHO PWR., 7% pf.	103	103	104
Ill. No. Utilities, 6% pf.	90	88	92
Ill. Pwr. & Lt., 7% pf.	k 97½	....	....
Ingersoll Rand	k 91	80½	105
Int. Combus. Engr., com.—no par.	k 44½	33½	54½
Int. Utilities, class A—no par.	k 32½	32	39
Int. Utilities, class B—no par.	k 5½	4½	9½
Interstate Pwr., pf., $7 no par.	k 92	....	....
Interstate Pub. Serv., 7% pf.	94½	96½	97
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT. 7% pf.	95	95½	96½
Jersey Central Pwr. & Lt., com.—no par.	45	45	50
Johns-Manville, com.—no par.	k138	130	152
KANSAS CITY PWR. & LT., pf.	k109½	107½	110½
Kansas Gas & Elec., 7% pf.	f 99½	99	102
Kelvinator Corp., com.—no par.	m 76	76	89½
Kentucky Hydro-Elec., pf.	a 94	91½	95
Kentucky Sec., 6% pf.	77	75	77
Kentucky Sec., com.	k100	....	....
Kentucky Utilities, 6% pf.	92	90	95
Keystone Pwr. & Lt. 7% pf.	95	95	97
Kings County Ltg., 7% pf.	100	101	106
Kings County, Ltg., 8% pf.	103	105	108
LACLEDE GAS LT., com.	155	146	168
Lehigh Pwr. Sec., com.—no par.	k 13½	10	23
Long Island Ltg., 7% pf.	103	105	107
Long Island Ltg., com.—no par.	125	145	150
Los Angeles Gas & Elec., 6% pf.	k 96	....	....
Louisville Gas & Elec., Class. A	k23½	22½	26½
MANHATTAN ELEC. SUPPLY	k 68½	56	76½
Manila Elec., com.—no par.	33	27½	35
Maytag Mfg., com.	k 20½	19	23½
Memphis Pwr. & Lt., pf., $7, no par	103	103	105
Metro. Edison, pf.—$6—no par.	k 92	....	....
Metropolitan Edison, pf., $7, no par.	101	102	106
Metropolitan Edison, com., no par.	45	45	50
Middle West Utilities, 7% pf.	a107	97½	111½
Middle West Utilities, 7% pr. lien pf.	a116	106½	123½
Middle West Utilities, com.—no par.	a117	109	134½
Midland Utilities, pr. ln. pf.	a 98½	98	100
Midland Utilities pf. A	a 96	96	98
Milwaukee Elec. Ry. & Lt., 7% pf.	100	....	....
Milwaukee Elec. Ry. & Lt., 6% pf.	91	....	....
Minn. Pwr. & Lt., 7% pf.	l 99	100	103½
Miss. Pwr. & Lt., pf.	k101	....	....
Miss. River Pwr., 6% pf.	93	94	96
Miss. River Pwr., com.	k 60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	101	101	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	91	90	97
Mohawk Hudson Pwr., com.—no par	m 23½	21½	28½
Montana Pwr., pf.	m114½	112½	119½
Montana Pwr. com.	k 72	69½	83½
Montreal Pwr., com.	f 228½	....	....
Mountain States Pwr., pf.	k 95	....	....
Mountain States Pwr., com.	k 22	....	....
NASSAU & SUFFOLK. LTG., pf.	92	93	95
National Carbon, com.	m124	n120	n130
National Carbon, pf.	a128	125	128
National Elec. Pwr., pf.	91	93	95
National Electric Pwr-A.	a 21	19½	26
Nat.-Lt., Ht. & Pwr., com.—no par.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72½	71	73
National Pwr. & Lt., pf., $7—no par.	k 98	96	102½
National Pwr. & Lt., com.—no par.	k 20½	16½	38½
National Pub. Serv., 7% pf.	90	90	94
National Pub. Serv., ptc. pf.	94½	96	97½
National Pub. Serv., A com.—no par	k 19½	15½	24
National Pub. Serv., B com.—no par	11½	10	12½
Nebraska Pwr., 7% pf.	l103	103	105½
Nevada-Calif. Elec., com.	23	18½	44½
New Brunswick Pwr., pf.	25	30	40
New England Pub. Serv., pr. ln. pf.	97	98	99½
New England Pub. Serv., pf.	88	95½	97
N. J. Pwr. & Lt., 7% pf.	103	104	108
New Orleans Pub. Serv., 7% pf.	98	100	102
New Orleans Pub. Serv., com.—no par.	m 30	n 31	n 38½
N. Y. Central Elec., 7% pf.	97	98	100
Newport News & Hampton Ry., Gas & Elec., com.	110	108	112
Newport News & Hampton Ry., Gas & Elec., pf.	110	109	114
Niagara Falls Pwr., 7% pf.—25.	k 28½	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf.	108	110	111½
Niagara, Lock. & Ont. Pwr., com.—no par.	m 60½	n 60	n 73
Niger Corp., A.—no par.	m 84½	n 37	n 84½
Niger Corp., B.—no par.	m 69	60	89½
No. Amer., 6% pf.—50.	k 50	49	50½
No. Amer., com.—10.	k 47½	42	67
No. Amer. Edison pf.—no par.	k 93½	91½	95½
No. Amer., Lt. & Pwr., pf.	90	88	90
N.C. Pub. Serv., pf.—$7—no par.	k 90	....	....
Northeastern Pwr., com.	k 20½	17½	38½
No. Indiana Gas & Elec., pf. A.	99	98	100
No. N. Y. Utilities, 7% pf.	k102½	....	....
No. Ohio Pwr., com.—no par.	m 13½	13½	26½
No. Ohio Trac. & Lt., 6% pf.	76	78	81
No. Ohio Trac. & Lt., 7% pf.	86	88	91
No. Ont. Lt. & Pwr., pf.	k 82	....	....
No. Ont. Lt. & Pwr., com.	73	45	70
No. States Pwr., 7% pf.	k 99	....	....
No. States Pwr. com.	k101½	97	136½
No. Texas Elec., 6% pf.	m 58	60	65
No. Texas Elec., com.	m 40	40	45
OHIO BRASS, com. B—no par.	74	70	79
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	90	92	95
Ohio Pwr., 6% pf.	94	93	95
Ohio Pub. Serv., 6% pf.	90	90	93
Ohio Pub. Serv., 7% pf.	99	98½	100
Ohio River Edison, pf.	98	99½	101½
Oklahoma Gas & Elec., pf.	k 95	....	....
PACIFIC GAS & ELEC., 6% pf.	k 98	....	....
Pacific Gas & Elec. com.	k120	118	132½
Pacific Pwr. & Lt., 7% pf.	f 99½	98	101½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Tuesday, April 13. lBid, low, high, Wednesday, April 14. mLatest quotations available. n1925.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday April 10	Low 1926	High 1926
STOCKS—Continued			
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt. & Pwr., pf.—no par	c 72½	71	73½
Penn-Ohio Elec., 7% pf.	95	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	96½	94	97
Penn-Ohio Pwr. & Lt., 8% pf.	102	100	106
Penn Pwr. & Lt.—$7—no par	f104	103	106½
Penn Pub. Serv., 7% pf.	99	96	100
Penn Pub. Serv., 6% pf.	86	85	90
Penn Wtr. & Pwr., com.	e145	140	171
Phila. Co., 5% pf.—50	m38	37½	38
Phila. Co., 6% pf.—50	k 49	47½	50½
Phila. Co., com.—50	k 74½	59½	76½
Phila. Elec., com.—25	c 44½	41½	67½
Pittsburgh Utilities, pf.—10	k 18½	14½	19½
Portland Elec. Pwr., 7% pf.	98	97	98
Portland Elec. Pwr., 6% pf.	72	71	75½
Portland Elec. Pwr., com.	k 40	....	....
Portland Ry., Lt. & Pwr., pf.	m 72½	....	....
Portland Ry., Lt. & Pwr., com.	m 49	....	....
Potomac Elec. Pwr., pf.	f106	....	....
Pwr. Corp. of N. Y., 7% pf.	m110	n 96	n112
Pwr. Corp. of N.Y., com—no par	m 79	77½	90½
Pwr. Sec., pf.—no par	k 13	....	....
Pwr. Sec., com.—no par	k 5	....	....
Pub. Serv. of N. J., 7% pf.	k105½	103½	108½
Pub. Serv. of N. J., 8% pf.	k117½	115	119
Pub. Serv. of N. J., com.—no par	k 76½	72	92½
Pub. Serv. of No. Ill., 6% pf.	a102	100½	102½
Public Serv. of No. Ill., 7% pf.	a116	112	116½
Pub. Serv. of No. Ill., com.—no par	a131	130	137
Pub. Serv. of No. Ill., com.	a131	130	131½
Pub. Serv. of Okla., 7% pf.	96	92	95
Pub. Serv. Elec. & Gas, 6% pf.	k 98	97	99½
Puget Sound Pwr. & Lt., 7% pf.	k105	....	....
Puget Sound Pwr. & Lt., 6% pf.	k 83	....	....
Puget Sound Pwr. & Lt., com.	k 50½	45	66½
RADIO CORP. OF AM., pf.—50	46	44½	47½
Radio Corp. of Amer., com.—no par	k 36½	32	46½
Republic Ry. & Lt., pf.	k103	....	....
Republic Ry. & Lt., com.	k 85	....	....
Rochester Gas & Elec., 5% pf.	95	80	98
Rochester Gas & Elec., 6% pf.	101	100	102
Rochester Gas & Elec., 7% pf.	104	105	107
ST. JOSEPH RY., LT., HT. & PWR., pf.	65	60	65
Servel Corp., Class A	k 19½	15½	30½
Servel Corp., Class B—no par	k 33	....	....
Sierra Pacific Elec., com.	k 26	23	28½
Sioux City Gas & Elec., 7% pf.	98	96	98
S. E. Pwr. & Lt., pf.—$7—no par	97	97	100
S. E. Pwr. & Lt., com.—no par	k 25½	21½	46½
So. Calif. Edison, 8% pf.	130	135	140
So. Calif. Edison, 7% pf.	k109	....	....
So. Calif. Edison, 6% pf.	k 98	....	....
So. Calif. Edison, com.	k120	115½	142
Southern Cities Utilities, 7% pf.	k 85	....	....
Southern Cities Utilities, com.	k 32	28	49
Southern Pwr. & Lt. of Md., pf.	m107	....	....
Southern Pwr. & Lt. of Md., com.	m 32	....	....
Southwestern Lt. & Pwr., A	k 55	....	....
Southwestern Lt. & Pwr., B	k 45	....	....
Southwestern Lt. & Pwr., $6 pf.	k 83	....	....
Southwestern Pwr. & Lt., 7% pf.	k101	....	....
Springfield (Mo.) Ry. & Lt., 7% pf.	95	....	....
Standard Gas & Elec., 8% pf.	55½	53½	57½
Standard Gas & Elec., 7% pf.	k 99	....	....
Standard Gas & Elec., com.—no par	k 55	51	69
Standard Pwr. & Lt., 7% pf.	k 93	....	....
Superheater, com.—no par	k131	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	118	....	....
Syracuse Lighting, com.	w 290	260	315
TAMPA ELEC., com.	k275	250½	330
Tenn. Elec. Pwr., 6% pf.	k 85	....	....
Tenn. Elec. Pwr., 7% pf.	k 98	....	....
Tenn. Elec. Pwr., pf.—$6—no par	m 80	....	....
Tenn. Elec. Pwr., com.—no par	m 65	....	....
Terre Haute, Ind. & East Trac., pf.	20	23	37
Terre Haute, Ind. & East. Trac., com	3	3	5
Tex. Pwr. & Lt., 7% pf.	f103	102	105
Tide Water Pwr., 8% pf.	k102	....	....
Timken Roller Bearing, com—no par	k 49	44½	56½
Toledo Edison, 8% pf.	111	112	114
Toledo Edison, 7% pf.	101½	101	103
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88½	87½	89
UNITED GAS & ELEC., 6% pf.	94	94	97
United Gas & Elec., com.—no par	m57	56	66
United Gas & Elec. (N.J.), 5% pf.	68	70	75
United Gas Impr.—50	c 91½	84½	144½
United Lt. & Pwr., pf.—$4—no par	45	....	51
United L. & P. pf.—$6.50—no par	83	81	91
United Lt. & Pwr. com., A—no par	k 69	68	143½
United Lt. & Pwr. com., B—no par	67	140	165
Utah Pwr. & Lt., 7% pf.	f100	99	103½
Utica Gas & Elec., 7% pf.	104	103	105
Utica Gas & Elec., com.	200	....	....
Utilities Pwr. & Lt., 7% pf.	k 92	....	....
Utilities Pwr. & Lt., com. B—no par	14½	14	18
VERMONT HYDRO - ELEC., 7% pf.	93	95	96
Virginian Pwr., 7% pf.	103	102	104
Virginian Pwr., com.	65	....	....
Virginia Ry. & Pwr., com.	m150	150	150
WAGNER ELEC., pf.	b 73½	70	85
Wagner Elec., com.—no par	b 23½	20	34½
Washington Ry. & Elec., com.	j205	....	....
Washington Ry. & Elec., pf.	j 90½	....	....
Washington Wtr. Pwr., com.	127	130	134
West Mo. Pwr., 7% pf.	k 91	....	....
West Penn., 7% pf. temp. ctfs.	m 99	95½	101
West Penn, com.	m125	118	130
West Penn Elec., pf.	97	96½	100½
West Penn Elec., Class A	92	88½	97
West Penn Pwr., pf.	110	108	112
West Va. Lt., Ht. & Pwr., 7% pf.	95	95	98
West Va. Utilities, 7% pf.—50	42	43	45
Western Pwr., 7% pf.	k 94	....	....
Western Pwr., com.—no par	m 80	n 34	n102
Western States Gas & Elec., 7% pf.	k 90	....	....
Western States Gas & Elec., com.	k 17	....	....
Westinghouse El. & Mfg., com—50	k 68½	65½	79½
Weston Elec. Instrument, Class. A	29½	27½	31½
Weston Elec. Instrument, com.	k 16	13½	19
Wheeling Elec., pf.	90	91	93½
Wis.-Minn. Lt. & Pwr., 7% pf.	m 90	....	....
Wis. Pwr., Lt. & Ht., 7% pf.	90	85	90
Worthington Pump, pf. A	76	73½	80
Worthington Pump, pf. B	k 54	53	65
Worthington Pump, com.	k 23	20½	44½
YADKIN RIVER PWR., 7% pf.	f102	102	105
Yale & Towne, com.—25	63	60½	64½
BONDS			
ABITIBI PWR., & PAPER	6s	1940 k101½	....
Adir. Elec. Pwr.	5s	1962 k101	....
Adir. Pwr. & Lt.	6s	1950 k105½	....
Adir. Pwr. & Lt.	5s	1930	97½ 97 99
Ala. Pwr.	5s	1946	99½ 99 100½
Ala. Pwr.	5s	1951	97 97 99½
Ala. Pwr.	6s	1951	104½ 104½ 105½
Ala. Trac., Lt. & Pwr.	5s	1962 m111	112 124
Aluminum Co. of Amer.	7s	1933	106½ 106½ 107½
Amer. Bosch Magneto	8s	1936 m103	2 ....
Amer. Gas & Elec.	5s	2007	92 92 93½
Amer. Gas & Elec.	6s	2014	99½ 98 100
Amer. Pwr. & Lt.	6s	2016	97½ 96 98
Amer. Pub. Serv.	6s	1942	99 98½ 100½
Amer. Wtr. Wks. & Elec.	5s	1934	97 95½ 97½
Amer. Wtr. Wks. & Elec.	6s	1975	94½ 92½ 94½
Anaconda Copper	6s	1929 k103	102½ 103½
Anaconda Copper	6s	1953 k103½	....
Anaconda Copper	7s	1938 k105	....
Appalachian Pwr.	5s	1941 k 99½	....
Appalachian Pwr.	6s	2024	93½ 93½ 95
Appalachian Pwr.	7s	1936	106 105 106½
Arizona Pwr.	6s	1933 100½	99½ 101
Arizona Pwr.	6s	1947	96 95½ 97
Ark. Central Pwr.	6s	1948	103 102 103½
Ark. Lt. & Pwr.	6s	1945 k104½	....
Ark. Lt. & Pwr.	6s	1954 k100½	....
Assoc. Gas & Elec.	6s	1965 k 94½	92½ 94½
Assoc. Gas & Elec.	6½s	1954 k101	....
BERLIN CITY ELEC.	6½s	1928 m 99	97½ 99½
Berlin City Elec.	6½s	1929	98 97 98½
Binghamtpn Lt., Ht. & Pwr.	5s	1946 k 99	....
Birmingham Elec.	6s	1954	103½ 102½ 104
Birmingham Ry., L. & P.	4½s	1954	91½ 88 92½
Broad River Pwr.	6½s	1934	100 100 102
Brooklyn Edison	5s	1949 k104½	....
Brooklyn Edison	6s	1930	105 103½ 106½
Buffalo Gen. Elec. 1st.	5s	1939	102 101½ 102½
Buffalo G. E., 1st & Ref.	5s	1939	101½ 101½ 102½
Buffalo G. E.	5s	1956	102 99½ 102½
Burlington Ry. & Lt.	5s	1932	96½ 96 97½
Butte Elec. & Pwr.	5s	1951 k100½	....
CALIF. ELEC. GEN.	5s	1948 k101	....
Calif. Gas & Ele.	5s	1937 k100½	....
Calumet Gas & Elec.	5½s	1960	98 97½ 99
Canadian Lt. & Pwr.	5s	1949	60 56 64
Canton Elec.	5s	1937	100½ 100 101
Carolina Pwr. & Lt.	6s	1938	101 100½ 101½
Carolina Pwr. & Lt.	6s	1953	104½ 104½ 105½
Cedar Rap. Mfg. & Pwr.	5s	1953	100 99½ 100½
Central Ark. Ry. & Lt.	5s	1928	99½ 99 100½
Central Ga. Pwr.	5s	1938	95 95 96½
Central Ill. Lt.	5s	1943 k100½	....
Central Ill. Pub. Serv.	5s	1952	92 92 93½
Central Ill. Pub. Serv.	5½s	1950	96½ 96 97½
Central Ill. Pub. Serv.	6s	1944	99½ 99 101½
Central Ind. Pwr.	6s	1947	98 98 99½
Central Ia. Pwr. & Lt.	6s	1944	100 99½ 101
Central Maine Power	5s	1939	99½ 98½ 100
Central N. Y. Gas & El.	5s	1941 k 98	....
Central Pwr. & Lt.	6s	1946 k101½	....
Central Pwr. & Lt.	6½s	1952 k104	....
Central States Elec.	6s	1945	91 91 98½
Chattanooga Ry. & Lt.	5s	1956	88½ 81 90
Cincinnati Gas & Elec.	5s	1956	102 102 103½
Cincinnati Gas & Elec.	5½s	1961	104½ 102½ 104½
Cities Service	6s	1966 k 92½	91½ 94
Cities Service	7sB	1966 k185	....
Cities Service	7sC	1966 k129½	125½ 131
Cities Service	7sD	1966 k103	101½ 104
Cities Service	7sE	1966 k109	....
Cities Service Pwr. & Lt.	5s	1944 k 94½	93½ 95½
City L. & P. Sedalia, Mo	5s	1952	84½ 83 85½
Cleveland Elec. Illum.	5s	1939	102½ 102½ 103½
Cleveland Elec. Illum.	5s	1954 k103½	....
Cleveland Elec. Illum.	7s	1941	111 110 112
Colorado Pwr.	5s	1953	97½ 95½ 98
Columbia Gas & Elec.	5s	1927 k100½	....
Columbia Ry., Gas & El.	5s	1936	93 92½ 95
Columbus, Dela. & Marion Elec.	5s	1937	85 83½ 86
Columbus, Dela. & Marion Elec.	6s	1937	94 93½ 96
Columbus Elec. & Pwr.	6s	1947 k102	....
Columbus Ry., Pwr. & Lt.	5s	1940 k 98	....
Columbus Ry., Pwr. & Lt.	6s	1941 k104	....
Commonwealth Edison	5s	1943 k102½	....
Commonwealth Edison	5s	1953	100 99½ 101
Commonwealth Edison	5s	1954 k100	....
Commonwealth Pwr.	5s	1939 k 91½	....
Commonwealth Pwr.	6s	1972 k 96	....
Commonwealth Pwr.	6s	1947 k103½	....
Community Pwr. & Lt.	6s	1950	99 98 99½
Conn. Ry. & Ltg.	4½s	1951	87 90½ 92
Consol. Cities Lt., Pwr. & Trac.	5s	1962	80 80 82½
Consol. Elec.	5s	1955	97½ 98 99
Consol. Gas of N. Y.	5½s	1945 k105½	....
Con. Gas. Elec. Lt. & Pwr. of Balti.	4½s	1935	c 95½ 95½ 98
Con. Gas. Elec. Lt. & Pwr. of Balti. (notes)	6s	1949	c107 105½ 107½
Con. Gas. Elec. Lt. & Pwr. of Balti	5s	1965	100½ 100 101½
Con. Gas. Elec. Lt. & Pwr. of Balti. (notes)	5½s	1952	105½ 105 105½
Con Gas, Elec. Lt. & Pwr. (notes)	6½s	1951	m109½ 109 109½
Consumers Elec. L. & P.	5s	1936	k 97 ....
Consumers Pwr.	5s	1936	k100½ ....
Consumers Pwr.	5s	1952	k100½ ....
Consumers Pwr.	5½s	1954	k103½ ....
Continental Gas & Elec.	5s	1927	k100 ....
Continental Gas & Elec.	6s	1947	k101 ....
Continental Gas & Elec.	6½s	1964	k 98 ....
Continental Gas & Elec.	7s	1954	k103 ....
Cumberland Cty. Pw. & Lt.	5s	1942	95½ 94 96½
DALLAS PWR. & LT.	6s	1949	104½ 104 105
Dayton Ltg.	5s	1937	100 100 101
Dayton Pwr. & Lt.	5s	1941	k 101 ....
Defiance Gas & Elec.	5s	1942	98½ 98 99
Denver Gas & Elec.	5s	1949	99 98 100
Denver Gas & Elec. Lt.	5s	1951	k 95½ ....
Des Moines Elec.	5s	1938	100 99 100½
Detroit Edison	5s	1933	101½ 101 102½
Detroit Edison	5s	1940	102½ 100½ 102½
Detroit Edison	5s	1949	101 100 102½
Detroit Edison	5s	1955	101½ 100½ 101½
Detroit Edison	6s	1932	m125 125 135
Detroit Edison	6s	1940	108½ 106 108½
Detroit Edison	7s	1928	m134 ....
Detroit Edison	7s	1929	m130 130 130
Detroit Edison	7s	1930	m125½ 125½ 138½
Dominion Pwr. & Trans.	5s	1932	96½ 95 97
Driver-Harris	8s	1931	96 95 98½
Dubuque Elec.	6s	1942	101½ 102 103½
Duke-Price Pwr.	6s	1949	103 102 104
Duquesne Lt.	6s	1949	k106 ....
Duquesne Lt.	5½s	1949	105½ 105 106½
Durham Pub. Serv.	7s	1949	100½ 99 101½
EAST PENN. ELEC.	6s	1953	104 105 106
East Oregon Lt. & Pwr.	6s	1929	100 100 101
East. Tex. Elec.	5s	1942	k 97 ....
Economy Lt. & Pwr.	5s	1956	98½ 99 100
Edison Elec. Illum. of Boston (notes)	4½s	1928	99½ 99½ 100½
Edison Elec. Illum. of Bklyn.	4s	1939	94½ 93 99½
Edison El. Illum. (N.Y.)	5s	1995	105½ 103 105
El Paso Elec.	5s	1932	m102 ....
El Paso Elec.	5s	1950	96 95 96½
El. Pwr. Corp. (Germany)	6½s	1950	k 88½ ....
Elec. Refrigeration	6s	1936	k102½ 100½ 107
Elmira Wtr., Lt. & R.R.	5s	1956	96 96 97
Empire Dist. Elec.	5s	1949	93½ 92 93½
Erie Ltg.	5s	1967	99 99 100½
Evansville G. & El. Lt.	5s	1932	99 99 100
FEDERAL LT. & TRAC.	5s	1942	94 92½ 97½
Federal Lt. & Trac.	6s	1942	102½ 100 104½
Federal Lt. & Trac.	6s	1954	94 93 96
Florida Power & Light	5s	1954	k 92½ 91½ 94
Florida Publ. Service	6s	1955	97 97 99
Florida Public Service	6½s	1949	99 100 103
Ft. Smith Lt. & Trac.	5s	1936	k 77 ....
Ft. Worth Pwr. & Lt.	5s	1931	100½ 99 100½
GALVESTON ELEC.	5s	1940	88 89 92
General Elec.	3½s	1942	88 87 88½
Georgia Carolina Pwr.	5s	1952	88½ 87 91
Ga. Lt., Pwr. & Rys.	5s	1941	87 88 92½
Ga. Ry. & Elec.	5s	1932	99½ 98½ 100½
Ga. Ry. & Elec.	5s	1949	95½ 95 97
Ga. Ry. & Pwr.	5s	1954	95½ 96 99
Ga. Ry. & Pwr.	6s	1947	k104 ....
Ga. Ry. & Pwr.	7s	1941	k105 ....
German Gen. Elec.	6½s	1940	97½ 93½ 99½
German Gen. Elec.	7s	1945	k 98 ....
Great Cons. Elec. Pwr. (Japan)	6½	1950	k 85½ 85 86
Great Cons. Elec. Pwr. (Japan)	7s	1944	k 91½ ....
Great Falls Pwr.	5s	1940	104 101½ 104½
Great Northern Pwr.	5s	1935	99½ 98½ 100
Great Western Pwr.	5s	1946	k 98½ ....
Great Western Pwr.	5½s	1955	99½ 99 101
Great Western Pwr.	6s	1949	102½ 102 103½
Great Western Pwr.	6s	1952	k102½ ....
HAMBURG ELEC.	7s	1935	k 95½ 94 96½
Havana Elec. R., Lt. & P.	5s	1954	93½ 92½ 94½
Holtwood Pwr.	6s	1954	104½ 100 104½
Houston Ltg. & Pwr.	5s	1931	100 99 101
Houston Ltg. & Pwr.	5s	1953	96½ 90½ 95½
Houston Ltg. & Pwr.	5½s	1954	100½ 99½ 102½
Hydraulic Pwr.	5s	1951	101½ 101½ 102
Hydraulic Pwr.	5s	1950	101½ 101½ 103
IDAHO PWR.	5s	1947	97½ 96 98½
Ill. Elec. Pwr.	6s	1943	103 102 - 103½
Ill. Pwr.	5s	1933	k 94 ....
Ill. Pwr.	6s	1944	k 98 ....
Ill. Pwr. & Lt.	5½s	1954	97½ 97½ 99
Ill. Pwr. & Lt.	6s	1953	101½ 100½ 102½
Ill. Pwr. & Lt.	7s	1953	102 102½ 103½
Ind. Elec.	6s	1947	98½ 98 100
Ind. Gen. Serv.	5s	1948	97½ 96½ 98½
Ind. Lighting	4s	1958	83½ 82½ 84
Indiana & Mich. Elec.	5s	1955	97 96 98½
Indiana & Mich. Elec.	5s	1957	99½ 97½ 100
Ind. Pwr.	7½	1941	m105½ n104 n106
Ind. Service	5s	1950	92½ 91½ 93
Ind. Service	6s	2020	83 83 88½
Ingersoll-Rand	5s	1935	100 ....
International Pwr. Sec.	6½s	1955	l 91 ....
Interstate Elec.	6s	1933	96 94 98½
Interstate Pwr.	6s	1944	k 99 ....
Interstate Pwr.	7s	1934	k 99½ ....
Interstate Pub. Serv.	6s	1948	99½ 98 99½
Iowa Ry. & Lt.	5s	1932	98½ 97½ 99½
Iowa Southern Utilities	5½s	1950	93 94 96
JERSEY CENT. PWR. & LT.	5½s	1945	95½ 95 98
KANSAS CITY PWR. & LT.	5s	1952	k103 ....
Kansas Elec. Pwr.	6s	1937	k101 ....
Kansas Elec. Pwr.	6s	1943	101 99½ 102
Kansas Gas & Elec.	6s	1952	104½ 101½ 105½
Kansas Gas & Elec.	6s	2022	93 92½ 93½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Tuesday, April 13. lBid, low, high, Wednesday, April 14. mLatest quotations available. n1925.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies		Bid Price Saturday April 10	Low 1926	High 1926
BONDS (Continued)				
Kentucky Hydro Elec....	6s	1949 100½	99½	101½
Kentucky Utilities.....	6s	1949 101½	99½	101½
Kings Cty. Elec. L. & P..	5s	1937 103½	102	103½
Kings Cty. Elec. L. & P..	6s	1997 123	120½	123
Kings County Ltg.....	5s	1954 98½	98½	100½
Kings County Ltg.....	6½s	1954 110	106	110
Knoxville Ry. & Lt.....	5s	1946 96½	95½	97
LACLEDE GAS LT....	5s	1934 101½	100½	101½
Laclede Gas Lt.....	5½s	1953 *k* 99½	98	100½
Laurentian Pwr.....	6s	1936 100	100	101
Laurentide Pwr.....	5s	1946 99½	100	102
Lehigh Pwr. Sec.'.....	6s	2026 *k* 95½	93	95½
Lincoln Gas & Elec.....	5s	1941 94	92½	94½
Long Island Ltg.....	5s	1936 *k*100½	....	....
Long Island Ltg.....	6s	1954 100½	99½	101½
Long Island Ltg.....	6s	1948 106	104½	106
Los Angeles Gas & Elec..	5s	1939 *k*100½	....	....
Los Angeles Gas & Elec..	5½s	1943 99	99	100½
Los Angeles Gas & Elec..	5½s	1947 *k*100½	....	....
Los Angeles Gas & Elec..	5½s	1949 99½	99	101
Los Angeles Gas & Elec..	6s	1942 104½	102½	104
Louisiana Pwr.....	6s	1944 99	98½	100
Louisville Gas & Elec....	5s	1952 *k* 99½	....	....
Louisville Gas & Elec....	5½s	1954 103½	102	103½
Lower Austrian Hydro El.	6½s	1944 85½	85	87½
Luzerne Cty. Gas & El...	5s	1948 98	97½	99
Luzerne Cty. Gas & El...	7s	1944 104½	103½	105½
Luzerne Cty. Gas & El...	6s	1954 103½	102	104
MADISON RIV. PWR..	5s	1935 100½	100	101
Manila Elec.....	7s	1942 *k*115	....	....
Manila Elec. Ry. & Ltg..	5s	1953 91½	89½	94
Manitoba Pwr.....	7s	1941 *m*105	103½	105½
Memphis Pwr. & Lt.....	5s	1948 99½	99	100½
Metropolitan Edison.....	6s	1952 107	104	108
Metropolitan Edison.....	5s	1953 *k*100	....	....
Metropolitan Pwr.....	6s	1953 104½	102½	104½
Michigan Lt.....	5s	1946 99½	99	100½
Michigan No. Pwr.....	5s	1941 98½	97	100
Milwaukee El. Ry. & Lt..	5s	1926 *m* 99½	99½	99½
Milwaukee El. Ry. & Lt..	4½s	1931 98½	97	99
Milwaukee El. Ry. & Lt..	5s	1951 *k* 99	....	....
Milwaukee El. Ry. & Lt..	5s	1961 *k* 95½	....	....
Milwaukee El. Ry. & Lt..	6s	1953 104	100½	104½
Minn. Pwr. & Lt.....	5s	1955 96½	95½	97
Minn. Pwr. & Lt.....	6s	1950 105	104	105½
Miss. Power.....	5s	1955 93½	92	94
Miss. River Pwr.....	5s	1951 99½	99	100½
Miss River Pwr.....	7s	1935 101½	102	103
Mo. Edison Elec.....	5s	1927 *m*100½	100½	100½
Mobile Elec.....	5s	1946 *k* 97½	....	....
Monongahela W. Pa. Pub. Service.....	5½s	1953 96	95	97½
Montana Pwr.....	5s	1943 *k*100½	....	....
Montgomery Lt. & W.P..	5s	1943 *m* 93	*n* 86½	*n* 93½
Montreal Lt., Ht. & Pwr.	4½s	1932 97	97	98½
Montreal Lt., Ht. & Pwr.	5s	1933 99½	99½	101
Montreal Pub. Serv.....	5s	1942 94½	94	95½
Mountain States Pwr.....	6s	1938 99½	98½	100
NASHVILLE RY. & LT.	5s	1953 97½	96½	98½
Nashville Ry. & Lt.....	5s	1958 92½	90½	92½
Nassau Lt. & Pwr.....	5s	1927 99½	98½	100½
Nassau & Suffolk Ltg....	5s	1945 91½	89½	92½
National Elec. Power....	6s	1945 92½	92½	94
National Pwr. & Lt.....	7s	1972 *k*103½	....	....
National Pub. Serv.....	6½s	1955 94½	94½	97
Nebraska Pwr.....	5s	1949 100½	99	101½
Nebraska Pwr.....	6s	2022 96½	94½	97½
Nevada-Calif. Elec.....	6s	1946 *k* 99½	....	....
Nevada-Calif. Elec.....	6s	1950 99½	98½	100
New Brunswick Pwr.....	5s	1937 83½	81½	85
New England Pwr.....	5s	1951 103½	100½	104½
New Jersey Pwr. & Lt....	5s	1936 98½	96½	99
New Orleans Pub. Serv...	4½s	1935 87½	87	88½
New Orleans Pub.Serv.,A.	5s	1952 *k* 93½	....	....
New Orleans Pub. Serv...	5s	1955 93½	90½	94½
New Orleans Pub. Serv...	6s	1949 90½	90	92½
N.Y. & Queens El. L.&P..	5s	1930 101½	100½	103½
N.Y. & Westchester Ltg..	4s	2004 80	79½	81½
N.Y. & Westchester Ltg..	5s	1954 98	97½	98½
New York Edison.....	6½s	1941 116	115	116½
New York Edison.....	5s	1944 *k*103½	....	....
N.Y. Gas & El. L., H.&P.	5s	1948 *k*104½	....	....
N.Y. Gas & El. L., H.&P.	4s	1949 *k* 90½	....	....
N.Y. State Gas & Elec...	5½s	1962 101	100	101
Newport News & Hampton Ry., Gas & Elec....	5s	1944 89	89½	91
Niagara Falls Pwr.....	5s	1932 102	100½	102½
Niagara Falls Pwr.....	6s	1932 106	104½	106½
Niagara Falls Pwr.....	6s	1950 105½	105	106½
Niagara, Lock. & Ont. Pwr.	5s	1954 *m* 98½	*n*104½	*n*110
Niagara, Lock. & Ont. Pwr.	5s	1955 100½	99	101
Niagara, Lock. & Ont. Pwr.	6s	1958 *m*106	....	....
Norfolk Ry. & Lt.....	5s	1949 95½	94	96½
No. Amer. Edison.....	6s	1952 *k*104½	....	....
No. Amer. Edison.....	6½s	1948 105½	103½	106
No. Amer. Lt. & Pwr.....	7s	1954 99	99	100½
North Caro. Pub. Serv...	5s	1934 *k* 92½	....	....
North Caro. Pub. Serv...	6s	1954 95	94½	96
North Caro. Pub. Serv...	6½s	1944 99	98	100½
North Shore Elec.....	5s	1940 100	98½	100½
No. Calif. Pwr.....	5s	1948 100	99½	106½
No. Ind. Gas & Elec.....	5s	1929 99½	99	100
No. Ind. Gas & Elec.....	6s	1952 104½	102½	105
Northern N. Y. Utilities..	5½s	1949 100	100	101½
No. Ohio Pwr.....	7s	1935 *k* 94	....	....
No. Ohio Trac. & Lt.....	4s	1933 88½	87	89
No. Ohio Trac. & Lt.....	5s	1956 84	84	86
No. Ohio Trac. & Lt.....	6s	1926 99½	99	100
No. Ohio Trac. & Lt.....	6s	1947 94½	92½	95½
No. Ontario Lt. & Pwr...	6s	1931 *m*100	*n* 95½	*n*100½
No. States Pwr.....	6½s	1933 *k*112½	108	132
No. States Pwr. (notes)....	6½s	1933 *k*103½	102½	104
No. States Pwr.....	6s	1948 *k*103	....	....
No. States Pwr.....	6s	1941 105½	105½	106½
No. States Pwr.....	5s	1941 *k* 99½	....	....
No. Tex. Elec.....	5s	1940 72	72	75
Northwestern Elec.....	6s	1935 102	102	103½
Northwestern Pub. Serv..	6½s	1948 101½	99½	101½
Nova Scotia Tr. & Pwr...	5s	1946 88	88	90
OHIO PWR.....	5s	1952 95½	94	95½
Ohio Pwr.....	6s	1953 104½	103½	104½
Ohio Pwr.....	6s	2024 95½	95½	96½
Ohio Pwr.....	7s	1951 105½	105½	106½
Ohio Pub. Serv.....	5s	1954 93½	92½	94½
Ohio Pub-Serv.....	6s	1953 101½	101	102½
Ohio Pub. Serv.....	7½s	1946 *k*113½	....	....
Ohio Pub. Serv.....	7s	1947 111	110½	111½
Ohio River Edison.....	6s	1948 *k*103½	....	....
Okla. Gas & Elec.....	5s	1950 94	93	94½
Okla. Gas & Elec.....	6s	1940 *k* 96½	....	....
Ontario Pwr. of Niagara Falls.....	5s	1943 100	99½	101
Ontario Transmission.....	5s	1945 99½	99½	99½
Ozark Pwr. & Wtr.....	5s	1952 80½	77	81½
PACIFIC COAST PWR..	5s	1940 99½	99	100½
Pacific Gas & Elec.....	5s	1942 *k* 99½	....	....
Pacific Gas & Elec.....	5s	1955 *m* 93½	*n* 94	*n* 95½
Pacific Gas & Elec.....	5½s	1952 *k*103	....	....
Pacific Gas & Elec.....	6s	1941 *k*107	....	....
Pacific Lt. & Pwr.....	5s	1942 *k*100½	....	....
Pacific Lt. & Pwr.....	5s	1951 100½	100	101½
Pacific Pwr. & Lt.....	5s	1930 *k*100	....	....
Pacific Pwr. & Lt.....	5s	1953 *m* 96½	....	....
Parr Shoals Pwr.....	5s	1952 97	95	98½
Paterson & Passaic G.&E.	5s	1949 101½	100	101½
Penn Central Lt. & Pwr...	6s	1953 103½	102½	105
Penn Edison.....	5s	1946 98½	96½	98½
Penn. Elec.....	6s	1955 105	92	105
Penn Elec.....	6½s	1954 105	97	100½
Penn.-Ohio Edison.....	6s	1950 *k* 98½	98½	106
Penn Ohio Elec.....	6½s	1938 107	105	107
Penn Ohio Pwr. & Lt.....	5½s	1954 *k* 98	....	....
Penn Ohio Pwr. & Lt.....	6s	1939 97½	97	98½
Penn Pwr. & Lt.....	5s	1952 98½	97½	99
Penn Pwr. & Lt.....	5s	1953 *k* 98½	97½	99
Penn Pwr. & Lt.....	6s	1953 105½	105	106
Penn Pwr. & Lt.....	7s	1951 105½	105½	106½
Penn Pub. Serv.....	5s	1954 97½	96	98½
Penn Pub. Serv.....	6s	1947 104	103	105
Penn Wtr. & Pwr.....	5s	1940 101½	101½	102½
Penn Wtr. & Pwr.....	5½s	1953 103½	102½	103½
Phila. Co.....	6s	1944 *k*104½	....	....
Phila. Co.....	5½s	1938 *k*100	....	....
Phila. Co.....	5s	1951 98½	97½	99½
Phila. Co.....	5s	1949 *m*104½	103½	104½
Phila. Elec.....	5s	1966 *c*103½	102	104½
Phila. Elec.....	4s	1966 *m* 86½	84	86½
Phila. Elec.....	5s	1960 *c*103½	102	103½
Phila. Elec.....	6s	1941 *c*107½	107½	108½
Phila. Elec.....	5½s	1947 *m*107	106½	107½
Phila. Elec.....	5½s	1953 *c*107½	103½	107½
Phila. Elec. Pwr.....	5½s	1972 *k*101½	100½	101½
Portland Elec. Pwr.....	6s	1947 101½	99	102½
Portland Gen. Elec.....	5s	1935 100½	99½	100½
Portland Ry., Lt. & Pwr..	5s	1942 91½	88½	93
Portland Ry., Lt. & Pwr..	6s	1947 100½	99	102½
Portland Ry., Lt. & Pwr..	7½s	1946 107½	106½	108½
Potomac Edison.....	6s	1949 100	99	100½
Potomac Edison.....	6½s	1948 103½	103	104
Potomac Elec. Pwr.....	5s	1929 *j*100	....	....
Potomac Elec. Pwr.....	5s	1936 *j*100½	....	....
Potomac Elec. Pwr.....	6s	1953 *j*106½	....	....
Potomac Elec. Pwr.....	7s	1941 *j*106½	....	....
Power Corp. of N. Y.....	6s	1942 100½	101	101½
Power Corp. of N. Y.....	6½s	1942 103½	104	105½
Power Securities.....	6s	1949 *k* 76	....	....
Pub. Lt. & Pwr.....	5s	1945 68	68	73
Pub. Serv. Co. of Colo...	5½s	1954 94½	95	96½
Pub. Serv. Co. of Colo...	6s	1953 100½	100	101½
Pub. Serv. Co. of Colo...	7s	1933 100½	101½	102½
Pub. Serv. Corp. of N.J..	5s	1959 *m*101	104½	105
Pub. Serv. Corp. of N.J..	6s	1944 *k*103	....	....
Pub. Serv. Co. of No. Ill..	5s	1956 98	98	99½
Pub. Serv. Co. of No. Ill..	5½s	1962 103½	103½	105
Pub. Serv. Co. of No. Ill..	5½s	1964 103	103½	105½
Pub. Serv. Co. of Okla...	6s	1949 100½	98½	100½
Pub. Serv. Elec. & Gas...	5½s	1959 *k*105	....	....
Pub. Serv. Elec. & Gas...	5½s	1964 *k*105½	....	....
Pub. Util. Evansville, (Ind.)	6s	1929 *k*100	....	....
Puget Sound Pwr.....	5s	1933 100½	99	101½
Puget Sound Pwr. & Lt...	5½s	1949 *k* 99	....	....
QUEBEC PWR.....	6s	1953 102½	101½	103
Queensborough Gas & E..	5s	1952 100	99½	100½
Queensborough Gas & E..	6s	1953 104½	104	105½
RHINE-WESTPHALIA ELECTRIC PWR.....	7s	1950 95½	93½	96
Rio de Janeiro Tram., Lt. & Pwr.....	5s	1935 94	93	94½
Robbins & Myers.....	7s	1952 63	60	68½
Rochester Gas & Elec....	5½s	1948 *k*105½	....	....
Rochester Gas & Elec....	7s	1946 112½	....	....
Rochester Ry. & Lt.....	5s	1954 100½	100½	101½
Rockford Elec.....	5s	‖1939 100½	99½	100½
ST. MAURICE PWR...	6½s	1953 108	108	109½
St. Paul Gas Lt.....	5s	1944 100½	100½	101½
St. Paul Gas Lt.....	5½s	1954 101½	101	102½
St. Joseph Ry., Lt. H.&P.	5s	1937 *k* 94½	....	....
Salt River Valley Wtr....	6s	1938 *k*100	....	....
Salmon River Pwr.....	5s	1952 100½	100½	101½
San Antonio Gas & Elec..	5s	1949 96½	96	97½
San Antonio Pub. Serv...	6s	1952 102½	101½	103½
San Diego Cons. G.& E....	5s	1939 *k*100	....	....
San Diego Cons.G.&E....	6s	1939 102½	101	102½
San Joaquin Lt. & Pwr...	5s	1945 99½	98½	100
San Joaquin Lt. & Pwr...	6s	1950 102½	103	104½
San Joaquin Lt. & Pwr...	6s	1952 102½	*n* 99½	103½
San Joaquin Lt. & Pwr...	6s	1954 101½	*n*100½	102½
Sauda Falls.....	5s	1955 *k* 95	93½	96
Savannah Elec. & Pwr....	7½s	1941 *k*104½	....	....
Saxon Pub. Wks. (Germany).....	7s	1945 *k* 95½	....	....
Scranton Electric.....	5s	1937 101½	101½	102½
Seattle Elec.....	5s	1930 101	100½	101½
Seattle Elec.....	5s	1929 99½	99½	100½
Seattle Elec.....	5s	1939 92½	92½	94½
Seattle Ltg.....	5s	1949 92	90½	94
Shawinigan Wtr. & Pwr..	5s	1934 100½	100	101½
Shawinigan Wtr. & Pwr..	5½s	1950 104	103½	104½
Shawinigan Wtr. & Pwr..	6s	1950 104½	104½	105½
Sheboygan Elec.....	5s	1946 95½	94½	96½
Siemens & Halske.....	7s	1928 *k* 99½	96	100
Siemens & Halske.....	7s	1935 *k* 96	93	98
Sierra & San Fran. Pwr...	5s	1949 *k* 74½	....	....
Sierra & San Fran. Pwr....	6s	1949 *k* 89	....	....
Sioux City Gas & Elec....	6s	1947 102	101½	102½
Sioux City Gas & Elec....	6s	1949 102½	102	103½
So. Caro. Gas & Elec.....	6s	1942 78	78	83
So. Caro. Gas & Elec.....	6s	1932 65	70	75
Southeast Pwr. & Lt. (ex-warranto).....	6s	2025 *k* 92½	89	93
So. Cal. Edison.....	5s	1939 *k*100½	....	....
So. Cal. Edison.....	5s	1944 98½	98	99½
So. Cal. Edison.....	5½s	1944 103½	103	104½
So. Cal. Edison.....	6s	1943 103	102	104
So. Cal. Edison.....	6s	1944 *k*104½	....	....
So. Cities Utilities.....	5s	1931 99	99	102
Southern Colo. Power....	6s	1947 *k* 98½	....	....
So. Ind. Gas & Elec.....	6s	1947 *k* 97½	....	....
Southern Pwr.....	5s	1930 100½	100	101
So. Public Utilities.....	5s	1943 100½	100	101½
So. Sierras Pwr.....	6s	1936 *k*103½	....	....
So. Utilities.....	6s	1933 *m*102	*n* 97½	*n*102½
So. Wisconsin Pwr.....	5s	1938 92	91	93
Southwestern Gas & E...	5s	1932 96	97	98½
Southwestern Gas & E...	6s	1957 97½	97½	99½
Southwestern Lt. & Pwr..	6s	1937 98½	98	99½
Southwestern Power.....	6s	1944 96½	96½	98
Southwestern Pwr. & Lt..	5s	1943 95	94	96
Southwestern Pwr. & Lt..	6s	2022 93½	94	96
Southwestern Pub. Serv..	6s	1945 95	94	96
Southwestern Utilities....	5s	1936 95	92½	96
Springfield Ry. & Lt....	5s	1926 99½	99½	100½
Standard Elec. of Cal....	5s	1939 100	99½	101
Standard Gas & Elec.....	6s	1935 *k* 99½	....	....
Staten Island Edison.....	6½s	1953 105½	106	107½
Superior Water, Lt. & Pwr.	4s	1931 94½	94½	95½
Syracuse Ltg.....	5s	1951 100½	100	100½
Syracuse Ltg.....	5½s	1954 104	103½	104½
TAMPA ELEC.....	5s	1933 *k* 99	....	....
Tenn. Elec. Pwr.....	6s	1947 *k*105	....	....
Tenn. Pwr.....	5s	1962 96½	96	97
Tex. Pwr. & Lt.....	5s	1937 98½	98½	100
Tex. Pwr. & Lt.....	6s	2022 96½	95½	97
Tide Water Pwr.....	6s	1942 101½	100	101½
Tide Water Pwr.....	7s	1937 101½	100	102½
Toho Elec. Pwr. (Japan)..	7s	1955 *k* 91½	....	....
Tokyo Elec. (Japan).....	6s	1928 *k* 97½	....	....
Toledo Edison.....	5s	1947 100	100	100½
Toledo Edison.....	7s	1941 *k*108½	....	....
Toledo Gas, Elec. & Htg.	5s	1935 100	98	100½
Toledo Tr., L.&P. (notes)	5½s	1930 99½	98	99½
Topeka Edison.....	5s	1930 99	99	100
Topeka Ry. & Lt.....	5s	1933 94½	94½	96½
Trenton Gas & Elec.....	5s	1949 101½	100½	101
Tri-City Ry. & Lt.....	5s	1930 *k* 98½	....	....
Twin State Gas & Elec....	5s	1953 94½	95	96½
Twin State Gas & Elec....	5½s	1945 98½	98	99
Tyrol Hydro-Elec. Pwr...	7½s	1955 96½	95½	97½
UJIGAWA ELEC PWR.	7s	1945 93	92	94
Union Elec. Lt. & Pwr...	5s	1932 101	100½	102½
Union Elec. Lt. & Pwr...	5s	1933 *k*101½	....	....
Union Elec. Lt. & Pwr...	5s	1954 99	99½	101
Union Elec. Lt. & Pwr...	5½s	1954 101½	100½	102½
United Elec. of N.J.....	4s	1949 88	87½	89
United Elec. Lt. & Pwr...	4½s	1929 98	98	99½
United Gas & Elec.....	6s	1945 *m*101½	*n* 96	*n*101
United Lt. & Pwr. (notes)	5½s	1928 99½	99	100½
United Lt. & Pwr.....	5½s	1959 95½	96	97½
United Lt. & Pwr.....	6½s	1974 95½	95½	98½
United Lt. & Rys.....	5s	1932 96	96	97½
United Lt. & Rys.....	6s	1926 99½	100	101½
United Lt. & Rys.....	6s	1952 100½	99	101½
United Lt. & Rys.....	6s	1973 88	89½	92
United Pwr. & Lt.....	6s	1944 102	102	103½
United Water, G. & E....	5s	1941 94½	94	95
Utah Lt. & Trac.....	5s	1944 *k* 88½	....	....
Utah Pwr. & Lt.....	5s	1944 *k* 96½	....	....
Utah Pwr. & Lt.....	6s	1944 102½	102½	104½
Utah Pwr. & Lt.....	6s	2022 92½	88½	94½
Utica Elec. Lt. & Pwr....	5s	1950 101½	100½	101½
Utica Gas & Elec.....	5s	1957 101½	100½	102½
Utica Gas & Elec.....	5½s	1949 104	103½	104½
VERMONT HYDRO - ELEC.....	6s	1929 100	100	101
Vicksburg Lt. & Trac....	5s	1932 94	93½	93½
Virginian Pwr.....	5s	1942 97½	88	97
Virginian Pwr.....	6½s	1954 *m*103½	103	104½
Virginia Ry. & Pwr.....	5s	1943 98½	97½	99
Virginia-Western Pwr....	6s	1953 107	101½	106½
WAGNER EL. MFG...	7s	.... *b*100½	100½	101½
Washington Coast Util...	6s	1941 102	102½	103½
Washington Ry. & Elec...	4s	1951 *j* 81½	....	....
Washington Ry. & Elec...	6s	1933 *j* 102½	....	....
Washington Wtr. Pwr....	5s	1939 101½	101½	102½
West Penn Pwr.....	5s	1963 101½	99½	102
West Penn Pwr.....	5s	1946 101½	99½	102
West Penn Pwr.....	5½s	1953 104½	104½	106
West Penn Pwr.....	7s	1946 106½	105½	108½
W. Va. Lt., Ht. & Pwr....	6s	1929 101	101	102½
West Virginia Utilities....	6s	1935 97½	95½	97½
W. Va. Water & Elec.....	6½s	1942 *m*103½	102½	104
Westchester Ltg.....	5s	1950 102	102½	103½
Western Elec.....	5s	1944 *k*102½	....	....
Western N. Y. Utilities....	5s	1946 97	96½	98
Western Pwr.....	6½s	1954 100	100	102
Western Pub. Service.....	6s	1950 96½	98	99½
West States Gas & Elec...	5s	1941 99	98½	99½
West States G.&E. (notes)	6s	1937 94½	94½	96
West States Gas & Elec...	6s	1947 *k* 99	....	....
West United Gas & El....	5s	1950 102	101½	102½
West United Gas & El....	6s	1950 *m*102	*n*100	*n*102
Westphalia Un. Elec. Pwr	6½s	1950 *m* 98½	....	....
Westinghouse El. & Mfg.	7s	1931 *k*106½	....	....
Wheeling Elec.....	5s	1941 98½	99	100
Wichita R. R. & Lt.....	5s	1932 85½	83	88
Winnipeg Elec.....	6s	1954 95½	96	97½
Wisconsin Elec. Pwr.....	5s	1954 98½	98½	99½
Wisconsin Gas & Elec....	5s	1952 *k* 99½	....	....
Wis.-Minn. Lt. & Pwr....	5s	1944 *k* 97	....	....
Wisconsin Pwr., Lt. & Ht	5s	1946 93½	92	94½
Wisconsin Pub. Service...	6s	1952 101½	101	102½
Wis. Ry., Lt. & Pwr.....	5s	1933 95½	94½	96½
Wis. River Pwr.....	5s	1941 93½	92½	94
Wolverine Pwr.....	7s	1943 101½	100	101½
YADKIN RIVER PR..	5s	1941 *k*100½	....	....
Yarmouth Lt. & Pwr.....	5s	1937 83	83	87
Yarmouth Lt & Pwr.....	8s	1951 101	99	102

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high, Tuesday, April 13. ‖Bid, low, high, Wednesday, April 14. *m*Latest quotations available. *n*1925.

Manufacturing and Markets

Construction Contracts Grow in Volume

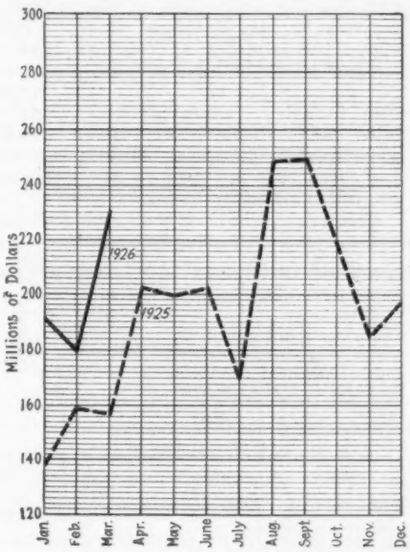
First Quarter 25 per Cent Ahead of Same Period Last Year—Proposed Work Is 17 per Cent Greater

THE money value of engineering construction contracts awarded during the first quarter of the year is 25 per cent ahead of the corresponding period last year, and work definitely reported as proposed is 17 per cent greater than during the same months in 1925, according to the *Engineering News-Record*. Contracts awarded during March, amounting to $230,320,000, were greater in money value than for the corresponding month in any year since 1913. For the month preceding the total was $180,032,000, and for the corresponding period last year it was $155,262,000. The value of contracts let, as shown in the accompanying table, consists of industrial buildings valued at $40,000 and over, commercial, public and other buildings worth $150,000 and up, waterworks having a value of $15,000 and up, and other public works at a minimum of $25,000.

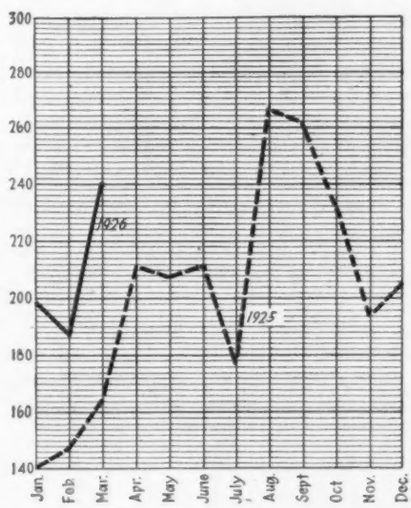
The gain in contracts during March extended to all classes of construction except federal government work, private bridge projects and privately owned unclassified jobs. The construction volume index number for March (not the mere money value of contracts let) is 240, and for the year 1925 it is 201. This means that the construction volume during 1925 is 101 per cent above that for the year 1913. The money value of contracts let during March was greatest in New York State, with Maryland next and Pennsylvania third, and after that in the order named came California, Illinois, Ohio, Florida and Michigan.

Less than half of the forty-eight states realized gains, comparing contract totals from Jan. 1 to date with the corresponding period last year. The twenty showing increases were as follows: Connecticut, Pennsylvania, Maryland, West Virginia, North Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, Kentucky, Ohio, Indiana, Illinois, Michigan, Arkansas, Nebraska, Colorado, New Mexico and Arizona. In half of these states the gains in money value were due to large commercial buildings. Streets and roads, however, formed the principal element in the totals for West Virginia, North Carolina, Georgia, Alabama and Mississippi.

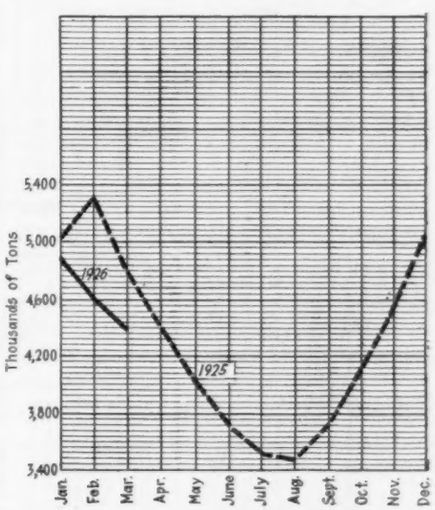
Industrial buildings led in Maryland, Kentucky, Indiana and Arizona. The activity in New Mexico was mainly in federal government work. Contemplated projects definitely reported as proposed totaled $1,653,771,000 for the first quarter of 1926, a gain of 17 per cent over the same period last year. This should result in a commensurate increase in both number and value of contracts for the second quarter of the current year.



CONTRACTS AWARDED IN THE UNITED STATES



CONSTRUCTION VOLUME AS COMPARED WITH AN INDEX OF 100 FOR 1913



UNFILLED TONNAGE AS REPORTED BY THE UNITED STATES STEEL CORPORATION

In the chart at the left the actual volume of construction is compared and not the mere money value of contracts let. (*Engineering News-Record* statistics.)

First Part of New Electrical Safety Code Now Ready

Rules for the installation and maintenance of electrical equipment in generating stations and substations are given in a new publication of the Bureau of Standards of the Commerce Department. These rules cover the general protective features of the sta-

(*Continued on page* 841)

VALUE OF CONTRACTS LET IN THE UNITED STATES AND CANADA, MARCH, 1926

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States	Jan. 1 to Date U.S.	Canada
Waterworks	$431,000	$1,198,000	$1,147,000	$1,239,000	$1,715,000	$492,000	$6,222,000	**$15,408,000**	$30,000
Sewers	.....	1,058,000	99,000	2,993,000	695,000	1,114,000	5,959,000	**18,802,000**	164,000
Bridges	133,000	1,379,000	1,423,000	1,102,000	485,000	203,000	4,725,000	**14,241,000**	.....
Excavation, drainage, etc.	.....	722,000	1,595,000	235,000	.....	105,000	2,657,000	**6,518,000**	.....
Streets and roads	.....	7,258,000	7,850,000	3,355,000	5,801,000	6,007,000	30,271,000	**62,449,000**	1,100,000
Industrial building	850,000	40,710,000	1,785,000	3,537,000	972,000	2,090,000	49,944,000	**107,416,000**	2,750,000
Commercial building	9,204,000	36,563,000	10,961,000	33,495,000	12,745,000	11,970,000	114,938,000	**309,363,000**	5,209,000
Federal government	.....	716,000	162,000	55,000	132,000	122,000	1,187,000	**10,411,000**	.....
Unclassified	1,365,000	9,952,000	118,000	513,000	2,020,000	449,000	14,417,000	**56,391,000**	1,565,000
March, 1926	$11,983,000	$99,556,000	$25,140,000	$46,524,000	$24,565,000	$22,552,000	$230,320,000	**$600,999,000**	$10,818,000
February, 1926	8,857,000	63,329,000	32,453,000	37,458,000	20,253,000	17,682,000	180,032,000	.....	4,752,000
March, 1925	19,160,000	45,859,000	13,381,000	25,678,000	34,155,000	18,678,000	156,911,000	.....	2,559,000
Jan. 1 to date 1926	**28,812,000**	**233,970,000**	**82,448,000**	**124,883,000**	**70,639,000**	**60,247,000**	**600,999,000**	.....	22,954,000
Jan. 1 to date 1925	43,776,000	167,960,000	44,741,000	68,691,000	88,177,000	68,079,000	481,424,000	.....	9,078,000

Industrial Activity Gains

Nation Shows a Material Increase in March in Metals, Textiles, Transportation and Stone and Clay

THE month of March witnessed a distinct upward trend in the general industrial activity of the nation. The adverse industrial situation which developed during February appears to have been only a temporary interruption. Such is the very favorable picture painted by data received by the ELECTRICAL WORLD and based upon the monthly electrical energy consumption of more than 1,500 large manufacturing plants in various industries and scattered throughout the nation—plants which consume more than five billion kilowatt-hours a year.

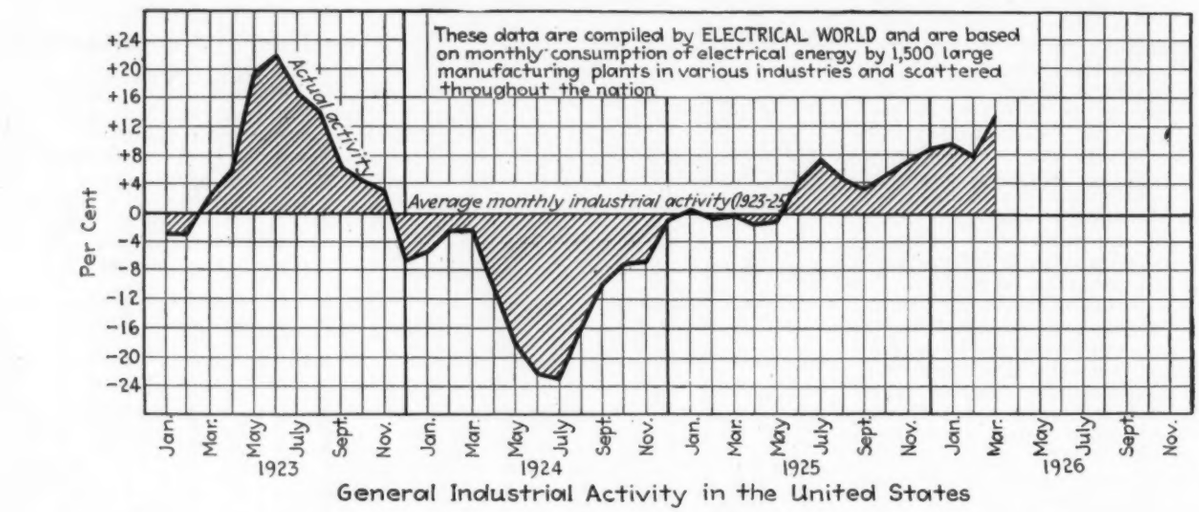
The returns received by the ELECTRICAL WORLD indicate that during March general industrial activity in the nation as a whole was 13.6 per cent above the average monthly industrial activity for the past three years, this figure having been corrected for seasonal variation and weighted in accordance with the importance of the various industries. In February general industry was operating at 7.8 per cent and in January at 9.6 per cent above the average monthly rate.

The metal industries taken as a group and for the nation as a whole report activity during March of 12.7 per cent above the monthly average as against 5.8 per cent during February and 11.3 per cent in January. The transportation industry, which includes automobiles and shipbuilding, also reports greater activity during March, increasing from 19.0 per cent to 31.3 per cent above the monthly average.

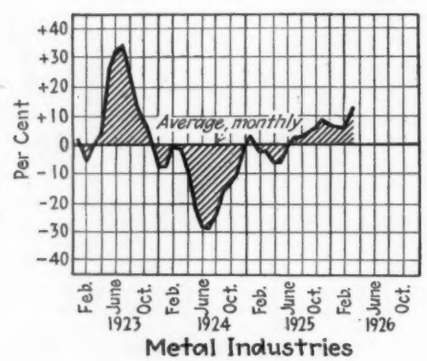
The textile industry staged a comeback, increasing its operations from 0.2 per cent to 12.8 per cent above the monthly average. Increased activity in the textile industry during March was reported by virtually every textile plant reporting. The leather industry, on the other hand, appears to have decreased its activity, the amount of electrical energy consumed by these plants during March being in most cases below the amount consumed during the shorter month of February. March activity in the leather industry was 7.2 per cent below the average monthly rate for the past three years. Activity in the lumber industry was also under that of February, decreasing from 18.7 per cent above the average monthly to 5.9 per cent.

The figures on activity in the various industries of the country are preliminary for the month of March and are subject to later correction.

"Electrical World" Barometer of Industrial Activity in the United States as a Whole

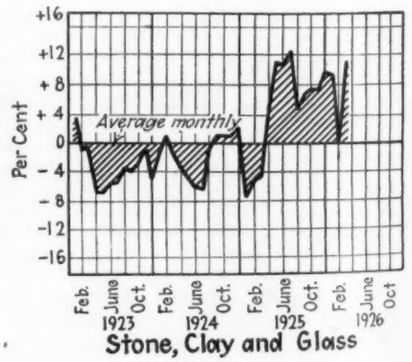


General Industrial Activity in the United States

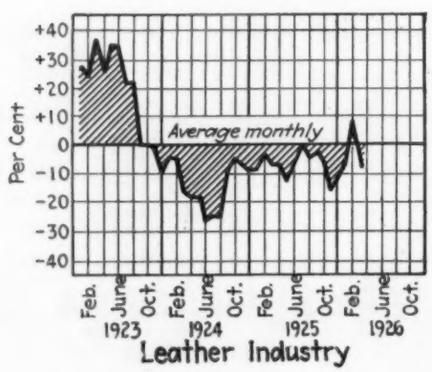


Metal Industries

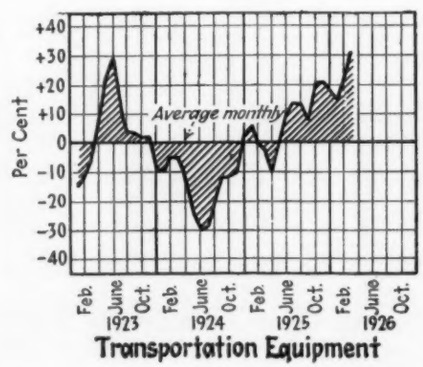
Textiles Industry



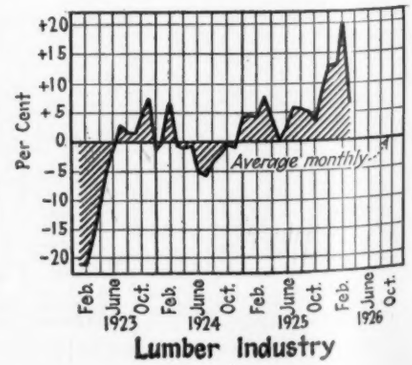
Stone, Clay and Glass



Leather Industry



Transportation Equipment



Lumber Industry

tion, as well as specific sections dealing with grounding, rotating equipment, storage batteries, transformers, conductors, fuses, switches, switchboards and lightning arresters.

In 1915 the bureau first formulated the National Electrical Safety Code, designed to obviate accident hazards in the electrical industry. The new publication, above referred to, forms a part of the fourth or 1925 edition of this code. The revision was carried out under the rules of procedure of the American Engineering Standards Committee, and the revised code will no doubt be approved as an American standard at the next meeting of the committee. Other parts of the revised code, dealing with electrical utilization equipment, line construction and radio installations, will be issued as separate handbooks as soon as they can be prepared. This first part of the code is known as Handbook 6 of the Bureau of Standards. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

Business Conditions

SALES of power apparatus were in large volume in the industry and included contracts aggregating about $500,000 placed by a central-station company on the Pacific Coast. Virtually all sections of the country report that motors are in strong demand and that the volume of inquiries is very encouraging. A number of interesting lumber and pulp mill projects on the Pacific Coast are bing planned for early installation.

The General Electric Company has announced its sales for the first quarter of 1926 as amounting to $86,433,658, an increase of 3 per cent over the corresponding period last year. A number of companies—particularly motor and transformer manufacturers—report an increase in sales for the same period. The United States Steel Corporation on Saturday last week, reported a reduction of 236,887 tons in forward orders at the close of March. This is not believed to indicate a reduction in buying during March, however, since production and shipment during the month were at a very high rate.

In New England power apparatus is in active demand. A prominent manufacturer records increasing interest in larger sizes of motors ranging from 50 hp. to 75 hp. Central-station supplies are moving steadily and the volume of inquiries is encouraging. Industrial electric heating continues to show activity, and the demand for building construction material is in good volume. The demand for motors is strong in the New York district, and manufacturers unanimously report a consistent increase in the volume of sales. Central-station buying is spotty, but a fair volume of transformer sales is reported. In the Southeast business continues satisfactory, with here and there a temporary lull. The demand for line-construction materials is excellent and probably will be sustained well into the summer. The volume of business is holding up well in the Middle West, and reports from all sections indicate that sales are good. Distribution equipment is in good demand and maintenance purchases are considerable. On the Pacific Coast large contracts have been let for the Melones plant of the Pacific Gas & Electric Company. Power-company inquiries have been comparatively small, industrial plants are buying equipment, and dealer business has been proportionately very large. Residence range sales are exceeding those made for apartment house installations.

Fair Volume of Sales in Metal Market—Tone Firmer

Materially better sentiment is in evidence among copper producers owing to the issuance of favorable statistics and because of better prices in London. Zinc and lead are likewise in a better position than a week ago. Tin is also fairly active at higher prices with both consumers and dealers in the market. March statistics showed a decline of 11,148 tons in stocks of refined copper and of 5,182 tons in combined stocks of blister and refined. Most producers have been asking 14 cents delivered in the East today since the figures became known. The prevailing price during the week has been 13.875 cents, delivered, this figure having been shaded on only one small sale and then by only 2½ points. A fair tonnage, though small, in comparison with the entire volume of business, was done at 14 cents and 14¼ cents in the Middle West.

A slight sag occurred in the lead market from Friday to Monday of this week, but it has been offset by the improved tone of the London market in the last two or three days. A small tonnage of lead was sold as low as 7.90 cents, New York, and 7.60 cents, St. Louis, but the metal offered at these levels was quickly disposed of and the market now seems firm at 8 cents, New York, and 7¾ cents, St. Louis. There has been some realignment among the sellers, one large interest that was selling fairly freely two or three weeks ago now offering to sell very unwillingly, whereas another large producer is anxious for all the business it can find, especially for May, though offering April shipment too. Consumers report little or no change in their business. A good volume of business in zinc developed when the price reached 7 cents per pound at St. Louis, galvanizers and brass founders both being in the market. Buying of tin was active at the lower level of prices.

NEW YORK METAL MARKET PRICES

	April 7, 1926 Cents per Pound	April 14, 1926 Cents per Pound
Copper, electrolytic	13.95	13.95–14⅛
Lead, Am. S. & R. price	8	8
Antimony	18½	17½
Nickel, ingot	35	35
Zinc, spot	7 35	7¼
Tin, Straits	63½	64
Aluminum, 99 per cent	28	28

Base copper price April 14, 1926, 16½ cents

Power Apparatus in Active Demand in New England District

Sales of small motors are active in the New England district. The demand for the small sizes shows an upward trend during the past week with the call for 5-hp. units quite strong. A prominent manufacturer records an increasing interest in larger sizes ranging from 50 hp. to 75 hp. and a number of orders for these have been placed recently, one of which was the delivery of fifteen units. Central-station supplies are moving steadily, and the volume of inquires is very encouraging. A number of transformer sales and a steady demand for meters are reported and, in addition, the movement in electrical recording instruments is favorable, with one manufacturer recording a substantial increase in the demand.

Industrial electric heating continues to show activity. A prominent manufacturer reports much demand among publishers for melting pots for use in connection with type heating. Another records a good demand for electrical heating plates and control devices among manufacturers of food-shop equipment for summer resorts and reports sales amounting to about $30,000 during the past three months. New construction activities are attracting much interest, and inquiries for pipe, cable, wire and wiring hardware are being received in good volume. Electric range sales are steady, but household appliance sales are spotty.

Line-Construction Materials in Demand in the Southeast

Business continues satisfactory in the Southeast, though here and there temporary lulls are to be noted. The excellent volume of business in electrical line construction materials is being sustained and indications are for its continuation well into the summer. Orders are for both high-tension and low-tension line materials, with satisfactory business reported in distribution transformers and meters. An outstanding item of the past week was in the electric elevator lines, permits for approximately $200,000 worth of elevator equipment having been issued in Atlanta alone, with prospects for several other large jobs to be closed within the next few weeks. Orders for freight lifts and small elevators have been somewhat quiet in recent weeks. Satisfactory sales are also reported in the electric conveyor line.

Orders for industrial construction materials are reported good, with prospects for even better business in the near future as successful bidders place orders for recently let electrification jobs. No large industrial projects were reported during the past week, but the business in prospect is very satisfactory. Central-station purchases of electric ranges and appliances continue very good, but dealers are not buying as heavily as was anticipated. Purchases by small electrical contracting firms are fair to good, though in and around Atlanta the small contractors are evidently not getting the volume of business that was obtained at this time last year. Large contracting firms in the territory, however, are quite active and are placing orders accordingly. Florida activities continue,

but on a slightly reduced scale, the demand being still ahead of the supply in most lines. The closing of a large turbine contract in central Florida is in prospect for the coming week.

Volume of Business Good in Middle West

The volume of business in the Middle West is holding up well. Reports from all sections indicate that sales are good and the general tone of the section is optimistic. Industrial plants continue active, and railroads report good business and are buying equipment. The various utility companies are planning a number of extensions and the general trend of their business is satisfactory. Distribution equipment, pole-line hardware, cable, etc., are in good demand and maintenance purchases are considerable. Building activity, noticeably good throughout the winter, is showing signs of increased activity. Numerous large building plans are being formulated, and it looks like a banner year as far as building operations are concerned. Jobbers' sales are considered satisfactory. While the volume of business transacted is not unusually large, few complaints are heard. Appliance sales are holding up well. Industrial lighting sales and the sale of motors have been quite large, with a good demand for wiring devices.

Demand for Motors Strong in New York District

The demand for motors for industrial purposes in the New York district continues strong, manufacturers almost unanimously reporting a consistent increase in the volume of sales. This activity is not reflected in other lines, however, and control equipment, circuit breakers, etc., are moving very slowly at present, although manufacturers of these products anticipate an improvement in the demand. Central-station buying is spotty, with a fair volume of transformer sales reported. A manufacturer of transformers reports that the total inquiries received in March were very large. Insulators and pole-line hardware also have a good market among holding companies for properties outside the New York district, although the demand for this equipment among the local operating companies is comparatively light just now. Subway construction jobs have resulted in recent orders for electrically driven compressors, transformers, etc. Manufacturers of switching equipment, circuit breakers, etc., report a decided dullness at present, although large numbers of inquiries are being received in that quarter.

Large Power-Equipment Contracts Let on Pacific Coast

Power-company inquiries on the Pacific Coast have been lighter than in previous weeks. Such inquiries have included assorted tools and line materials. Railroad purchasing is also smaller and covers chiefly schedule material. Dealers' business is proportionately the ranking classification. The low market price of rubber-covered wire has been responsible for many 25,000-ft. to 100,000-ft. orders in assorted sizes, the largest order being from Sacramento. Special socket prices have also been productive of much business. Business from industrial plants is very good. Fruit packers are erecting new plants, and mines are opening up. A recent order covered good quantities of wire, fuses, conduit and repair material for Alaska, and from the irrigation districts at Fresno and Turlock have come orders for wiring supplies aggregating $3,000. Contracts for the Melones plant of the Pacific Gas & Electric Company were let and included one for about $200,000, involving two 18,000-hp. reaction turbines complete with oil-pressure system and relief valves; another for penstock and intake valve equipment amounting to about $35,000, and another for approximately $200,000 worth of electrical equipment.

Authoritative announcement has been made of a new Puget Sound pulp and paper mill at Edmonds which will involve an initial investment of $200,000, of which $20,000 will be spent for electrical equipment, inquiries on which are now out. A Tacoma sawmill plant now under construction has placed inquiries for motors and other electrical equipment. The city of Seattle is planning the construction of two downtown substations, one to cost $500,000 and the other $670,000. The smaller will be equipped with transformers rated at 20,000 kw. and the larger with 30,000 kw. in transformers and a 15,000-kva. condenser. Sales of copper wire are reported as exceptionally large. Residence electric range sales are said to exceed those made for apartment-house installation, and the volume is exceeding quotas.

Activities of the Trade

General Electric Orders for First Quarter at High Rate

Orders received by the General Electric Company for the first three months of the present year totaled $86,433,658, Gerard Swope, president, has announced. This compares with $83,846,236 for the first three months of 1925, or an increase of 3 per cent. In a report to its stockholders the company states that the increased use of power and improved manufacturing methods have assisted in keeping the cost of its products, and therefore its selling prices, down. The company says that a study of the Schenectady factory indicates that supplementing the worker's skill by electrical power has enabled him to increase his earnings.

Cramp & Sons Receive Many Hydraulic Machinery Contracts

Hydraulic machinery contracts for seventeen units totaling nearly 500,000 hp. have lately been secured by the William Cramp & Sons Ship & Engine Building Company, Philadelphia, or its subsidiaries and licensees. The turbines, waterwheels and other hydroelectric devices composing these orders will be installed in Brazil, Japan, Canada and the United States. One contract calls for a 56,000-hp. impulse wheel. All the machinery for installation in foreign countries, with the exception of seven units contracted for in Canada, will be built by the I. P. Morris department of the Cramp company in Philadelphia. Two 5,000-hp. Moody propeller turbines are being manufactured for the Maribondo development in Brazil and two 29,000-hp. turbines for the Nippon Electric Company of Japan.

To the Philadelphia plant of the company has also been awarded a contract for two 31,000-hp. and one 25,000-hp. units for the Norwood development of the Carolina Power & Light Company. The 56,000-hp. impulse wheel will be built for the Southern California Edison Company in the San Francisco plant of the Pelton Water Wheel Company, which is owned by the Cramp company. Other new contracts booked by the Pelton plant include two 80,000-hp. impulse wheels for the Feather River Power Company. The Dominion Engineering Works, Ltd., of Montreal, Canadian licensee of the Cramp company, has secured contracts for seven hydroelectric units, these including three 30,000-hp. units and three 21,000-hp. units for the Canadian International Company and one 28,000-hp. Moody propeller unit for the Manitoba Power Company.

Electric Refrigeration Reports Good Business

The Electric Refrigeration Corporation, Buhl Building, Detroit, reports that business is good in all of its divisions. The year 1926 has already shown a 100 per cent increase in sales and shipments over last year and an increase in net earnings of 200 per cent. The Kelvinator gross receipts for March amount to 25 per cent of the gross sales of "Kelvinators" for the entire year of 1925. The company states that a big contract has just been closed with the Kelvinator-Collins Company of San Francisco, for the entire Pacific Coast territory — seven states—with an initial order for immediate shipment of seven carloads of "Kelvinators."

The sales of the Leonard division of the corporation for the year ending June 30, 1926, it is said will exceed those during 1925 by $1,000,000. The Nizer division of the corporation is running 10 per cent ahead of its 1926 production schedule and sales quota, and yet it has on hand at the present time unfilled orders for immediate shipment amounting to over $1,250,000.

Canadian Westinghouse Reports Activities in 1925

In announcing a slight reduction in the profits of the Canadian Westinghouse Company for the year 1925, H. H. Westinghouse, chairman of the board, in a statement to the shareholders, said: "Throughout the year general business activity in the Dominion was less than in the preceding year. The upward

trend in business conditions at the end of 1924, noted in the annual report for the previous year, did not prove to be of sufficient strength or duration to effect material improvement during the current year.

"A factor unfavorably affecting your company's business and having also a very potent negative tendency in general business conditions has been the continued absence of the transportation companies from the market for rolling stock for renewals or additions to their equipment. This, however, is a condition that obviously will not continue indefinitely, and its disappearance will affect favorably both the commerce of the country and the future operations of your company. Notable among the year's activities was the considerable amount of business booked by your company incident to the establishment of new pulp and paper plants and of extensions and additions to plants already in existence. These remarks apply equally to water-power developments, a great many of the existing power companies throughout the country having added to their generating and distributing equipment."

The National Carbon Company, Inc., 30 East Forty-second Street, New York, has purchased the battery business of the Manhattan Electrical Supply Company and will take over its operation on May 1. This includes the battery plants at Jersey City, N. J., and Ravenna, Ohio, together with all trademarks, patents and other assets pertaining to the dry-battery business of the Manhattan company. The products of the company made and sold under the trade name "Red Seal" will be manufactured and sold by the National Carbon Company under the same trademark.

The Pure Cold Products Company of America, Inc., 1440 Broadway, New York City, manufacturer of electric refrigerating apparatus, is said to be planning the construction of a new plant on Clark Street, Endicott, N. Y.

The F. W. Wakefield Brass Company, Vermilion, Ohio, announces that Carl J. Frisbee has become a member of its sales department and will have charge of sales of "Red Spot" lighting specialties in Ohio, Michigan, Indiana and Illinois.

The Coldak Corporation of New England has opened display rooms and headquarters at 889 Boylston Street, Boston. A complete line of Coldak refrigerators will be carried. A. P. Merchant has been appointed sales manager.

The Ingersoll-Rand Company, 11 Broadway, New York, announces the appointment of Harlan A. Pratt as manager of the oil and gas engine department. Mr. Pratt for the past three years has been sales manager of the Elevator Supplies Company of Hoboken, N. J.

The Graybar Electric Company, 100 East Forty-second Street, New York City, announces that C. D. McClary has been made sales manager of the Philadelphia distributing branch of the company. Mr. McClary was formerly manager of the Pittsburgh distributing branch of the company. The company also announces that J. F. Davis has been made manager of the Pittsburgh branch. Mr. Davis was formerly sales manager of the New York distributing house of the company.

The Illinois Electric Company, 312 West Madison Street, Chicago, jobber, announces the establishment of a branch house at 104 Chestnut Street, Peoria. Edgar A. Sorrell has been appointed district manager in charge.

The Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, manufacturer of industrial lighting equipment, wiring devices and other specialties, in its annual report for 1925 shows current assets of $5,265,114. Current liabilities of the company for accounts payable, bills payable, dividends accrued and accrued interest and commission, royalty, etc., amount to $936,359; first mortgage 6 per cent gold bonds, $1,440,000; reserves, real estate and personal property taxes, etc., $85,957, and capital stock outstanding, $2,147,500. This leaves a surplus of $655,297 at the end of 1925 and compares with a surplus of $517,016 at the end of 1924.

The Philadelphia Storage Battery Company, Ontario and C Streets, Philadelphia, has completed plans for the construction of a new addition to its plant to take care of a considerable increase in output.

The Signal Electric Manufacturing Company, Menominee, Mich., manufacturers of bells, fans, etc., announces that W. J. Tideman has been appointed secretary and treasurer of the company, to succeed Charles E. Hammond, who has resigned.

The Uehling Instrument Company, Paterson, N. J., manufacturer of "Apex" CO_2 recorders and other power plant instruments, announces the appointment of W. B. McBurney, 619 Trust Company of Georgia Building, Atlanta, as representative for Georgia and eastern Tennessee.

The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, manufacturer of pole-line hardware, line material, etc., announces that since April its Pittsburgh office has been removed from room 829 Oliver Building to room 1123 Bessemer Building in order to provide larger quarters.

John A. Stevens, consulting engineer on power problems of industries, has moved his offices from 8 Merrimack Street to 16 Shattuck Street, Lowell, Mass.

The Garl Signal Company, 61 Bartges Street, Akron, Ohio, capitalized at $100,000, has recently been incorporated and will market the Garl fire and police alarm signals for municipalities and industrial plants. The new company has taken over the good will, basic patents, etc., of the Garl Electric Company. Manious Garl, inventor of the system, has been retained as research and engineering chief.

The Roller-Smith Company, 233 Broadway, New York City, manufacturer of electrical instruments and circuit breakers, announces that the Tennessee Engineering & Sales Company, General Building, Knoxville, Tenn., has added to its territory the states of Georgia, Florida and South Carolina, in addition to the eastern Tennessee territory. The company also announces that the former arrangement with W. A. McCombs & Company, Westinghouse Building, Pittsburgh, has been transferred to a newly formed organization, the D-C Sales Engineering Company, at the same address. The personnel of the new organization comprises T. M. Cluley and G. S. Denithorne. Mr. Cluley as manager of W. A. McCombs has been identified with the Roller-Smith interests in the Pittsburgh section for several years.

The Morse Chain Company, Ithaca, N. Y., manufacturer of power transmission chain, announces the opening of an office in the Ellicott Square Building, Buffalo, N. Y. Maurice R. Hart, who has been with the company for several years in the production department and the last two years in the sales department, has been appointed manager.

The Westinghouse Electric & Manufacturing Company has recently added a new four-story brick and concrete building, with a floor space of 142,600 sq.ft., to its Mansfield plant. The new manufacturing unit, which is of the most modern fireproof construction, will be devoted to the construction and assembly of ranges and flatirons.

The Rollway Bearing Company, Inc., Syracuse, N. Y. announces the following changes in its sales force: C. A. Call, formerly assistant sales manager of the Gurney Ball Bearing Company, has been appointed sales manager; E. J. Lybert, formerly representing the company in the Philadelphia district, now takes charge of the Detroit district; J. D. Firmin, for many years associated with the engineering department of the Niles-Bement-Pond Company, is now engineering representative in the Philadelphia district, and W. E. Smith has been transferred from the home office to the Youngstown district.

The Circle F Manufacturing Company, Trenton, N. J., manufacturer of electrical and porcelain specialties, announces that the Murphy Company, 902 Georgia Saving Trust Building, Atlanta, has been appointed its representative in North Carolina, South Carolina, Florida, Alabama and in Tennessee as far west as Nashville.

The Ohio Electric & Controller Company, 5900 Maurice Avenue, Cleveland, announces that the Railway Power & Engineering Corporation, Ltd., manufacturer of small motors and lifting magnets, 133 Eastern Avenue, Toronto, Canada, and the Industrial Supply Company, Brown-Marx Building, Birmingham, have been appointed its representatives.

The Swartzbaugh Manufacturing Company, Toledo, Ohio, announces that it has placed on the market a two-heat combination electric cooker, thermal jug, ice-cream freezer and fireless cooker. It is known as the "EC Jr.-10." The company distributes directly and also through the Graybar Electric Company.

The Morganite Brush Company, Inc., 519 West Thirty-ninth Street, New York, manufacturer of carbon brushes, etc., will begin the construction of a new four-story plant, 60 ft. x 200 ft., at Rawson Street and Anable Avenue, Long Island City.

New Trade Literature

MOTOR-DRIVEN AIR COMPRESSORS.—The Pennsylvania Pump & Compressor Company, Easton, Pa., has issued bulletin No. 127 covering the Pennsylvania single-stage direct-connected, synchronous-motor driven air compressors. It contains illustrations showing various applications of the compressors and also tables of sizes and capacities of same.

POWER FACTOR.—"Capacitors" is the title of bulletin GEA-352 issued by the General Electric Company, Schenectady, N. Y., in which it describes and illustrates the method of securing more power over the same line through the use of its static condenser equipment, known as "Capacitors."

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Geneva, Switzerland (No. 19,940), of electric dish-washing machines.

Purchase and agency is desired in Buenos Aires, Argentina (No. 19,950), for electrical appliances, radio sets and parts.

Purchase and agency is desired in Caracas, Venezuela (No. 19,969), for electrical appliances.

An agency is desired in Bombay, India (No. 19,948), for small electrical appliances.

An agency is desired in Colombo, Ceylon (No. 19,945), for electrical devices, such as wiring accessories, fans, small motors and household equipment, electric lamp shades and radio tubes.

An agency is desired in Melbourne, Australia (No. 19,946), for electrical novelties and accessories, household appliances, including washing machines, sewing machines and vacuum cleaners.

Purchase and agency is desired in Vienna, Austria (No. 19,987), for household appliances and electro-medical appliances; also for radio sets and parts (No. 19,943.)

An agency is desired in Munich, Germany (No. 19,941), for household appliances and wiring devices.

An agency is desired in Sydney, Australia (No. 19,942), for automobile lamp bulbs.

An agency is described in Prague, Czechoslovakia (No. 19,944), for electrical coffee, spice and chemical mills.

An agency is desired in Reisholz, Germany (No. 19,961), for radio sets and parts, conveying machinery and equipment for building and road construction.

Purchase is desired in Quebec, Canada (No. 19,986), of electric washing machines.

Purchase is desired in Venice, Italy (No. 19,937), of hand-driven and motor-driven coffee-hulling machines.

An agency is desired in Tokyo, Japan (No. 19,964), for elevators.

Purchase is desired in Florence, Italy (No. 19,954, of motors, centrifugal, suction and pressure pumps.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

STONINGTON, MAINE.—The Stonington & Deer Isle Power Company, recently incorporated, plans to supply electricity for manufacturing purposes in the Deer Isle district. L. H. Noyes and others are interested in the project.

BELLOWS FALLS, VT. — The local property of the International Paper Company, has been acquired by the New England Power Company, Worcester, Mass., as a site for a proposed power plant. The old mill buildings will be razed. The initial installation will have a capacity of 45,000 hp. Transmission lines will be erected to connect the plant with the system of the New England Power Company.

BOSTON, MASS.—Bids will be received at the office of the Transit Department, 1 Beacon Street, until April 27 for electrical equipment for the Harrison Square substation of the new Dorchester line, to be made part of the Boston transit system.

WORCESTER, MASS. — Contract has been awarded by the American & Steel Company for the construction of a continuous billet and rod mill at its South Works, to replace the present mills, at a cost of more than $1,000,000. Four steam engines of a combined capacity of 12,000 hp. will be replaced by electric motors.

WINDSOR LOCKS, CONN.—Preliminary plans are being prepared by the J. G. White Engineering Corporation, 43 Exchange Street, New York City, for a power plant, to cost about $200,000, at Windsor Locks, for the Northern Connecticut Power Company, Hartford.

Middle Atlantic States

AUSABLE CHASM, N. Y.—Plans are being prepared by the Estes Rainbow Power Company, Ausable Chasm, for a hydro-electric power plant, to cost about $100,000. C. T. Middlebrook, Jr., 68 State Street, Albany, is architect and engineer.

BUFFALO, N. Y.—Plans for the proposed local cement manufacturing plant of the Great Lakes Portland Cement Company, Trust Building, along the Hamburg Turnpike, to cost about $1,500,000, include a power plant.

BUFFALO, N. Y.—Petition has been filed by the Niagara, Lockport & Ontario Power Company for approval of electric franchises granted by the towns of Alma, Scio, Friendship and Willing. The company proposes to erect transmission and distribution lines through the towns of Alma, Scio and Willing into the town of Friendship.

GEDDES, N. Y.—The Syracuse (N. Y.) Lighting Company, Inc., has petitioned for approval of an electric franchise granted by the Town Board of Geddes. Post office address Syracuse.

GOVERNORS ISLAND, N. Y.—Bids will be received by the Signal Corps Procurement District, Governors Island, until April 22, for 91,200 ft. fibre conduit (Circular 39).

NEW YORK, N. Y. — Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 27, for twelve motor-generator sets and spare parts (Schedule 5266).

NYACK, N. Y.—Bids will be received by the Board of Water Commissioners until April 29 for water works improvements, including building and structures, filter and chemical equipment, pumping machinery and electrical power equipment, etc. Nicholas S. Hill, Jr., 112 East Nineteenth Street, New York City, is consulting engineer.

ELIZABETH, N. J.—Steps have been taken by the Broad Street Improvement Association for the installation of 1,000-watt lamps along Broad Street, to replace the present 600-watt lamps.

MILLVILLE, N. J.—The installation of additional lamps in the outlying districts is under consideration by the City Commission.

COAL CENTER, PA.—Permission has been granted the West Penn Power Company, Pittsburgh, to erect a transmission line across the Monongahela River, in Coal Center.

CORRY, PA.—Plans are under consideration by the City Council for rebuilding the electric fire-alarm system throughout the city, at a cost of about $15,000.

NORRISTOWN, PA.—The installation of an ornamental lighting system on West Main Street, to cost $10,000, is under consideration by the Town Council.

PHILADELPHIA, PA.—The Philadelphia Electric Company plans to build a number of substations, extensions in present substations and additions in transmission and distributing lines during 1926.

SMYRNA, DEL.—A franchise has been granted the Eastern Shore Gas & Electric Company, Salisbury, Md., to install a substation and distribution system for local service. The municipal electric plant will be closed down.

WHITESVILLE, W. VA.—The Whitesville Utilities Company, recently incorporated, plans to supply electricity in Whitesville. David A. Jayne, J. P. Summers and others of Charlestown, are interested in the project.

RICHMOND, VA.—A preliminary permit has been granted the Roanoke River Power Company, to build a power plant on the Roanoke River at Buggs Island, near Clarksville.

TOANA, VA.—Plans are under way by the Virginia Light & Power Company, Richmond, which has acquired the local plant, to extend its transmission line from Williams to Toana and Yorktown. The local system will be rebuilt and extended.

WASHINGTON, D. C. — Bids will be received by the United States Engineer, Navy Building, until May 18, for furnishing and installing three generators, automatic switching and electrical equipment.

WASHINGTON, D. C. — Bids will be received by the Chief of Air Service, United States Army, Washington, until April 20, for 500 single throw toggle switches (single pole), 500 lamp assemblies, 500 connector panel assemblies, 28 switch assemblies (Circular CAS-129), and for 200 aircraft storage batteries (Circular CAS-128).

North Central States

NILES, MICH.—The City Council contemplates the installation of an improved lighting system on three main streets. The Council has rejected the offer of the Indiana & Michigan Electric Company for the purchase of the municipal electric plant. E. F. Crabill is superintendent of Board of Public Works.

HAMILTON, OHIO.—Bids will soon be asked by the City Council for the construction of a new municipal electric plant, to cost $500,000. The Forelich & Emery Engineering Company, Toledo, is engineer.

VERSAILLES, OHIO.—The City Council contemplates extensions in the street-lighting system to recently annexed territory.

HAZARD, KY.—The Kentucky & West Virginia Power Company contemplates erecting a transmission line from Fleming to Betsey Lane, Logan and Charleston.

INDIANAPOLIS, IND. — Bids will be received by the Board of School Commissioners, Indianapolis, until April 22, for a motor-generator set and switchboard apparatus for the science laboratory at the new Washington High School.

NOBLESVILLE, IND.—Plans are under way by the Northern Indiana Power Company, Guaranty Building, Indianapolis, for an equipment storage and distributing building, to cost about $50,000.

ANTIOCH, ILL.—A petition has been presented to the Village Board asking that an ornamental lighting system be installed on Main Street. Electric service is supplied by the Public Service Company of Northern Illinois, Waukegan.

BLOOMINGTON, ILL. — Bids will be received by the Board of Trustees of the Bloomington and Normal Sanitary District, 422 Unity Building, Bloomington, until May 6 for construction of a sewage treatment plant and appurtenances, including pumping station, etc. Taylor & Woltmann, 225 Unity Building, are engineers.

BURNSIDE, ILL.—The Illinois Central Railroad Company, Chicago, plans to install electric power equipment in its proposed locomotive repair shop, to cost about $300,000.

CHICAGO, ILL.—Bids will be received by the Signal Corps Procurement District, Chicago, until April 27, for 11,150 telephone switchboard lamps (Circular 35). Also, until April 20, for a quantity of switchboard equipment, (Circular 34).

HIGHLANDS, ILL.—Improvements are contemplated to the municipal electric light plant this summer, to cost about $40,000. New equipment including one or two generating units will be installed. The W. A. Fuller Company, 1917 Railway Exchange, St. Louis, is engineer.

ANTIGO, WIS.—Bids will be received by the City of Antigo until April 21 for the construction of a sewage treatment plant, including five pumps with motors.

MAPLEWOOD, WIS.—Arrangements are under way by the Wisconsin Public Service Corporation, Green Bay, to install and maintain a street-lighting system here.

MARINETTE, WIS.—The Board of Park Commissioners is considering the installation of an ornamental lighting system in Henes Park, to cost $10,000.

CEDAR RAPIDS, IOWA. — Application has been made by the Central States Electric Company for a franchise to erect a transmission line, extending 17 miles north of Stratford and connecting Webster and Hamilton Counties.

FORT DODGE, IOWA. — Improvements to the street-lighting system, including the installation of ornamental lamps on several

blocks between Third and Twelfth Streets and First Avenue North and First Avenue South. The cost is estimated at $24,000.

RUSHVILLE, MO.—The distribution system of the Rushville Electric Light & Power Company has been purchased by the St. Joseph (Mo.) Railway, Light, Heat & Power Company. This system will be used in connection with the extension of the latter company's service to communities and farms in Buchanan and other counties about St. Joseph.

ST. LOUIS, MO.—The power house of the United Railways Company of St. Louis at its yards at Sarah Street and Park Avenue, was recently destroyed by fire.

HOOPLE, N. D.—The Otter Tail Power Company, Fergus Falls, Minn., plans to erect a transmission line in this section.

Southern States

CHESTER, S. C.—The Southern Public Utilities Company, Charlotte, N. C., plans to install an outdoor substation here.

LUDOWICI, GA.—Bonds to the amount of $8,000 have been voted for the installation of a municipal lighting plant.

MACON, GA.—Plans for rebuilding the plant of the Southern Box & Basket Company, recently destroyed by fire, include a power house.

SENOIA, GA.—A franchise has been granted the Georgia Railway & Power Company, Atlanta, to extend its transmission line into the city for light and power service.

FORT MYERS, FLA. — Bonds to the amount of $125,000 have been authorized for improvements to the fire-alarm system, etc.

HOWEY, FLA.—Bonds to the amount of $300,000 have been voted for municipal improvements of which $26,750, will be used for improvements to electric system.

PALM BEACH, FLA.—Bonds to the amount of $2,000,000 have been voted for municipal improvements of which $125,000 will be used for extensions and improvements to street-lighting system, including the installation of ornamental lamps.

PENSACOLA, FLA.—Preliminary plans are under way by the Alabama Power Company, Birmingham, Ala., for the construction of a local substation, to cost about $25,000.

SAFETY HARBOR, FLA.—The Tampa Electric Company, Tampa, plans to erect a transmission line here, for local service.

ST. PETERSBURG, FLA.—Steps have been taken by the North Fourth Street Development Association for the installation of ornamental lamps on that thoroughfare and adjacent streets.

SALERNO, FLA.—The City Council has granted the Florida Power & Light Company, Miami, a franchise to supply electricity here.

CHATTANOOGA, TENN. — Preliminary plans have been prepared by the Tennessee Electric Power Company for the erection of a 33,000-volt transmission line from Sparta to Monterey, via Algood, 45 miles long, and from Sparta to Crossville, a distance of 30 miles with a distribution system at the latter place. The cost is estimated at $90,000. L. C. Parks, Alberta Apartments, is engineer.

DUNLAP, TENN.—Plans for the proposed local furniture plant to be erected by D. M. Harris include a power plant.

ERWIN, TENN. — Surveys are being made by the Golding Son's Company and the Erwin Feldspar Company, which have recently purchased a water power site on the Nolichucky River, near Erwin, with the view of developing the water power. It is proposed to build a hydro-electric plant to supply power to operate two feldspar mills in Erwin. The initial installation will have a capacity of 1,000 hp.

ROGERSVILLE, TENN.—A petition for an approval of a franchise to operate in Hawkins and Hamblen Counties has been filed with the Public Utilities Commission by the Holston River Electric Company.

COLLINSVILLE, ALA.—Plans are under consideration by Walter Weaver, Collinsville, to establish an electric plant on Sand Mountain to serve electricity to Lathamville, Skirum, Garaldine, Dawson and Kilpatrick.

COTTER, ARK.—The White River Power Company, Little Rock, has applied for permission to build a hydro-electric development on the White River, to cost about $200,000.

McGEHEE, ARK.—The Arkansas Power & Light Company, Pine Bluff, which recently acquired the municipal electric plant, plans to extend its transmission line here for local service.

MALVERN, ARK.—Plans for rebuilding the local plant of the Wisconsin-Arkansas Lumber Company, recently destroyed by fire, with a loss of about $75,000, include a power house.

TILLAR, ARK.—The local plant of the Arkansas Light & Power Company, Little Rock, was recently destroyed by fire, causing a loss of about $6,000.

NEW ORLEANS, LA.—A petition has been presented to the City Council by the property owners along the Canal Boulevard asking for the installation of an ornamental lighting system along the boulevard.

SHREVEPORT, LA. — Work will soon begin by the Southwestern Gas & Electric Company on the erection of a 132,000-volt transmission line from the Shreveport, Arsenal Hill, generating plant, now under construction, to Texarkana, Ark. Two hundred and twenty-five miles of aluminum cable and 10,000 suspension type insulators have been purchased for the proposed line.

NAVINA, OKLA.—A contract has been awarded by the City Council for the installation of a municipal electric lighting system. Electricity will be received over a municipally-owned transmission line connected with the system of the Oklahoma Railway Company, Oklahoma City.

DECATUR, TEX.—The Texas Power & Light Company, Dallas, plans to extend its transmission lines into Sunset, Krum and Ponder.

DEL RIO, TEX. — Surveys are being made by the Texas Central Power Company, San Antonio, for a large power dam and hydro-electric plant to be erected on Devils River, near here, to serve electricity in Del Rio and surrounding farms and ranches.

SUNSET, TEX.—The Texas Power & Light Company, Dallas, plans to erect a transmission line to this vicinity, with substation for light and power service.

Pacific and Mountain States

CHEHALIS, WASH. — Application has been made to the Lewis County Commissioners by the Puget Sound Power & Light Company, Seattle, for a franchise to erect a transmission line in the Hannaford Valley to serve several coal mines and farms, and for a power line along Ocean Beach from Chehalis River Bridge into Wallville, 19½ miles long, and thence to the town of Lebam, a distance of about 11 miles.

HOQUIAM, WASH. — Two franchises have been granted the Puget Sound Power & Light Company, Seattle, one for extending its lines on the Wenzell Road near Elma, and the other for additional service in Woodlawn addition in Hoquiam.

OAKVILLE, WASH.—The Puget Sound Power & Light Company, Seattle has applied to the City Council for a franchise to supply electricity here.

OVINGTON, WASH. — Application has been filed with the State Supervisor of Hydraulics by Edward Fitzpatrick, Ovington, for an appropriation of 30 second ft. of water from Sapoel Creek. The plans provide for a development of 3,600 hp., to cost about $50,000.

SUNNYSIDE, WASH. — H. L. Miller, Sunnyside, and associates have applied for permission to build a hydro-electric power development in this vicinity to develop 35,000 hp.

EUGENE, ORE.—The City Council is considering plans for a proposed municipal hydro-electric development, consisting of three power plants with a total output of 71,400 hp. The cost is estimated at $4,281,780.

PORTLAND, ORE. — Plans have been filed by the Northwestern Electric Company for a substation at 950 Weidler Street, to cost about $23,000.

GLENDALE, CAL.—The Council plans to call an election to submit the proposal to issue $100,000 in bonds for the installation of a fire-alarm and police signal system.

LOS ANGELES, CAL.—The City Council has approved the installation of ornamental lamps on Vincent Avenue from Hill Drive to the Eagle Rock Townsite line, and also on portions of Los Flores Drive and Chickasaw Avenue, using concrete standards.

MAYWOOD, CAL.—Plans have been prepared for paving and installing street lamps on Atlantic Avenue, between the south city boundary and Fifty-second Street, to cost about $100,000. V. Wood, American Bank Building, Los Angeles, is engineer.

SAN DIEGO, CAL.—The City Council has approved the installation of ornamental lamps on University Avenue, from Boundary to Euclid Streets.

SAN GABRIEL, CAL. — The Board of County Supervisors, Los Angeles, plans to install ornamental lamps on San Gabriel Boulevard, from the Southern Pacific Railway to Las Tunas Drive, using metal standards.

SANTA BARBARA, CAL.—The City Council is considering the installation of ornamental lamps on State Street, in the business district.

SANTA MONICA, CAL.—The City Council has approved the installation of ornamental lamps on Colorado Avenue, using concrete standards. Howard B. Carter is city engineer.

STOCKTON, CAL. — The City Council plans to install an improved lighting system on a number of streets. W. B. Hogan is city engineer.

WILLOWS, CAL.—A new lighting system, to cost about $3,000, will be installed on Butte Street.

WILSON, CAL.—Plans have been prepared by the Great Western Power Company, San Francisco, for a substation in Wilson, to cost about $100,000. Ashley & Evers, 58 Sutter Street, San Francisco, are engineers. Post office address Tudor.

IDAHO FALLS, IDAHO — Plans are under way by the City Council for extensions to the municipal electric plant.

LEWISTON, IDAHO.—Work will soon begin by the Inland Power & Light Company on the construction of a hydro-electric power plant on the Clearwater River, with an initial capacity of 12,300 hp. The cost of the plant, with transmission system, is estimated at $1,000,000. E. V. Lorenz is engineer.

BISBEE, ARIZ.—The Arizona Edison Company, Douglas, which has acquired the property of the Bisbee Improvement Company is planning to erect a transmission line between Bisbee and Douglas, a distance of 27 miles. When completed the local plant will be closed down and electricity served from the Douglas plant.

DOUGLAS, ARIZ.—The installation of a 2,000-hp. Diesel engine in its local power station is under consideration by the Arizona Edison Company.

SELIGMAN, ARIZ.—Permission has been granted to Lamport & Donovan, Seligman, to construct and operate an electric power plant in Seligman.

YUMA, ARIZ.—The installation of an ornamental lighting system on Main and Third Streets is under consideration by the City Council and Chamber of Commerce.

GREAT FALLS, MONT. — Plans are being prepared by the Montana Power Company, Butte, for the construction of a hydro-electric plant at the Black Eagle Dam, with an initial capacity of 25,000 hp., to cost about $1,000,000, with transmission line.

BRUSH, COLO.—At an election held recently the proposal to sell the municipal electric plant to the Public Service Company of Colorado, Denver, was carried. The company plans to extend its transmission lines into the Beaver Valley and make extensive improvements to the local service.

Canada

GALT, ONT.—The erection of a substation is under consideration by the Public Utilities Commission.

RIVERSIDE, ONT.—An expenditure of $25,000 has been authorized by the Town Council for street-lighting and extensions to the Hydro-Electric development in the town. Service is supplied by the Walkerville Hydro-Electric Commission.

TORONTO, ONT. — The Hydro-Electric Power Commission of Ontario, is considering the erection of from 200 to 225 miles of high-tension transmission line from Toronto to Ottawa River, to cost about $5,000,000.

TORONTO, ONT.—Expenditures contemplated by the Hydro-Electric Power Commission of Ontario during 1926 are estimated at $15,520,000. The work includes an eastern Ontario transmission line, to cost $3,000,000, and a new development at Port Severn, and Musquash in the Muskoka system, to cost $200,000. The erection of a 110,000-volt transmission line, at a cost of $1,000,000, in the St. Thomas district is included.

OUTREMONT, QUE.—The City Council has appropriated $29,000 for improvements to the electric-lighting system.

Electrical Patents

Announced by U. S. Patent Office

(Issued March 16, 1926)

1,577,123. CONNECTOR FOR ELECTRICAL CONDUCTORS; W. C. Hunt, Toronto, Ontario, Canada. App. filed June 19, 1924. To supply the place of soldering and other permanent connections with a device that is not easily removed by an unauthorized person.

1,577,151. ELECTRIC LIGHT; R. C. Abelt, Jr., Argonne, Wis. App. filed April 11, 1925. With duplex filaments.

1,577,179. INSULATED WIRE AND THE METHOD OR ART OF MAKING SAME; W. E. Cook, St. George, N. Y. App. filed Nov. 20, 1917. In which the electrical conductor is covered with a fibrous mass saturated or impregnated with an asphaltum or other waterproofing, insulating composition and a braid, and the method or art of applying said fibrous material and said braid to the wire.

1,577,208. CONTROLLER FOR LUMINOUS ELECTRIC SIGNS; F. H. Eeles, Paris, France. App. filed Oct. 25, 1923. Sign comprising a board of lamps uniformly distributed, each lamp having a circuit breaker included in its circuit, all the circuit breakers being grouped in a similar manner to the lamps and so that they can be actuated by a perforated strip or band which is driven by hand or by a motor.

1,577,231. ELECTRICAL RELAY; S. C. Hofmann, Champaign, Ill. App. filed Nov. 21, 1924. Alternating-current induction motor relay of the vane type, a construction which will prevent the vane from occupying an intermediate position wherein both the front and the back contacts are open when the relay is under-energized.

1,577,276. ELECTRICAL HEATER; W. Whitten, Schenectady, N. Y. App. filed Nov. 15, 1923. Makes use of the action of eddy currents in a substantially solid core of preferably magnetic metal or material.

1,577,300. ELECTRIC TIME SWITCH; E. Schanke, Santa Rosa, Cal. App. filed May 4, 1925. Wherein a rotatable contact is arranged to be engaged and moved by a contact carried by the hour hand of a clock mechanism for closing and maintaining closed circuit, and to be moved out of engagement with said hour-hand contact to break the circuit at a predetermined time and permit independent movement of the hour hand.

1,577,303. DYNAMO-ELECTRIC MACHINE; J. Schurch, Los Angeles, Cal. App. filed Oct. 16, 1922. Having in the field structure a compensating winding for taking care of armature reaction and a commutating pole for the purpose of reversing the current under the brushes, and thus providing for sparkless commutation, and having special ventilating means.

1,577,304. MOTOR WHEEL FOR VEHICLES; J. Schurch, Los Angeles, Cal. App. filed Oct. 16, 1922. Electric vehicles in which the driving motor is incorporated in the wheel.

1,577,337. DYNAMO-ELECTRIC MACHINE; B. McCormick, St. Louis, Mo. App. filed April 13, 1925. Self-excited synchronous motors, compensated asynchronous motors and converters, whether of the single or polyphase type, and pertains to means for improving commutation. The rotor is provided with a polyphase winding supplied with line current through slip rings and with a commutated winding which may or may not be interconnected with the polyphase winding. The stator, or induced member, is provided with an exciting winding in circuit with the commuted winding by means of brushes through adjustable resistance. The exciting winding is preferably displaced by a small angle from the axis of the brushes. The induced member is also provided with a starting winding displaced from the exciting winding and closed on itself over adjustable resistance.

1,577,348. ATTACHMENT PLUG; S. McClatchie, Cambridge, Mass. App. filed July 24, 1920. Swivel type.

1,577,397. CONTROL OF VEHICLES PROVIDED WITH ELECTRICAL TRANSMISSION; H. K. Whitehorn, Maidstone, England. App. filed March 24, 1924. Having an engine driving a dynamo to supply power to a motor (or motors), which transmits the power to the driving wheels.

1,577,413. FIXTURE; J. A. Volk, Jr., Norwalk, Conn. App. filed March 22, 1922. Conduit hood; one and the same size of conduit hood or other fixture arranged to fit and attach to conduits of different sizes or diameters.

1,577,419. ELECTRIC SPOT-WELDING MACHINE; F. M. Cushing and W. L. Cushing, Los Angeles, Cal. App. filed March 12, 1923. Having electrodes which move relatively to each other to permit the insertion and withdrawal of the work and also permit the lateral movement of one or both of the electrode-carrying devices for the purpose of reaching positions otherwise unavailable, and an arm with means for raising and lowering it into operative position with the lower arm and with improved means for facilitating the lateral movement of the lower arm relative to the upper arm.

1,577,420. DEVICE FOR AUTOMATICALLY CUTTING OUT DEFECTIVE SECTIONS IN ELECTRIC DISTRIBUTION NETWORKS; R. Deuser, Berlin-Charlottenburg, Germany. App. filed Feb. 27, 1925.

1,577,433. PROTECTIVE DEVICE FOR USE IN CONNECTION WITH POTHEADS; P. F. Williams, Chicago, Ill. App. filed Aug. 10, 1917. A dummy cap adapted to fit upon the upper end of the pothead body when the pothead cap is removed, and a body on which said pothead cap may be mounted, and means for mounting said pothead and dummy devices near one another.

1,577,434. ELECTRIC RADIANT-HEATER STRUCTURE; A. Kempston and G. J. Henry, San Francisco, Cal. App. filed Sept. 8, 1925. Adapted to the heating of rooms by convection as well as by radiation. Electric heating resistances mounted upon a refractory plate member with a large number of circulation passages provided through the said member and adjacent to the heating coils, through which air is circulated and heated by intimate contact with the resistance element and the heated passage walls in the refractory member.

(Issued March 23, 1926)

1,577,477. FUSE PLUG; H. E. Bruckner, Charlottenburg, near Berlin, Germany. App. filed April 13, 1923. Edison fuse plug provided with a fuse support or carrier on which are mounted a plurality of fuses which can be successively brought into the circuit.

1,577,456. ADJUSTABLE ELECTRICAL RESISTANCE APPARATUS; F. M. Ende, New York City, and P. A. Armstrong, Loudonville, N. Y. App. filed April 23, 1924. Adapted for rheostats, potentiometers, grid leaks, audibility meters, etc. Practically continuous variability or adjustability is secured by moving relatively to one another an electrical resistance element and a contact member of fluid metallic electrical conducting material, such as mercury, for example, thus doing away with the wiping mechanical contact members commonly used in prior apparatus, making the operation completely smooth and noiseless and making possible the inclosure of all the members with no exposed moving parts and avoiding the liability of corrosion and the like attendant upon exposed working parts.

1,577,460. ELECTRIC MAGNETIC MOTOR; A. Franca, Fall River, Mass. App. filed Aug. 26, 1925. Designed for use where an oscillating or intermittent rotary motion is adaptable for producing desired results.

1,577,489. ELECTRODE HOLDER; C. C. Peck, Cleveland, Ohio. App. filed April 11, 1925. Of portable type; wherein means are incorporated for cooling both the implement and the portion of the pencil back of its operating point, so that the implement may be handled without discomfort and the body of the pencil be prevented from reaching an oxidizing temperature. A further object is so to construct the holder that the current passing therethrough to the electrode or pencil will be required to traverse the latter the shortest possible distance.

1,577,497. DECK-LAMP LIGHTING FIXTURE; E. J. Schroeder, Summit, N. J. App. filed March 8, 1923.

1,577,500. ELECTRODE FOR ELECTRIC ARC WELDING; E. A. Tornblom, Stockholm, Sweden. App. filed Aug. 14, 1923. Comprising a metallic member and a coating on said member consisting of an alkaline composition mixed with tragacanth gum.

1,557,553. ROTARY RECTIFIER; W. J. Baker, Chillicothe, Mo. App. filed Sept. 14, 1920. For rectifying alternating current and which will deliver continuous current of a nature suitable for charging automobile storage batteries and like work.

1,577,611. ARC LAMP; A. P. Davis, Brooklyn, N. Y. App. filed Jan. 16, 1918. Flaming-arc lamps. Means for feeding the electrodes to compensate for the consumption thereof, for rotating the electrodes from time to time so as to center the arc properly, and for maintaining the arc at the desired point throughout the operation of the lamp.

1,577,618. SPEED-REGULATING MECHANISM; H. C. Ford, Jamaica, N. Y. App. filed May 6, 1922. For maintaining constant the speed of a prime mover and which shall be so constructed that if for any reason the speed of the prime mover is not checked by the mechanism, the moving parts of the speed-regulating mechanism will not be injured.

1,577,663. ELECTRIC CURRENT AND VOLTAGE REGULATOR; E. E. Taeubert, Los Angeles, Cal. App. filed June 21, 1920. For storage-battery generator power plant. The provision of an automatically operable regulator device particularly adaptable for connection with an electric generator and interposed in the power line of a generator, for providing a substantial uniform supply of current when the generator is used for charging a storage battery; also for providing a substantially uniform voltage.

1,577,685. APPARATUS FOR COMMUTATING ELECTRIC CURRENTS; C. S. Bradley, New York, N. Y. App. filed July 6, 1922. The particular form of apparatus, which constitutes a direct current transformer, comprises a plurality of stationary transformers, similar to those used in the alternating-current art, having their low and high-tension coils respectively all connected in series in a closed circle, and in combination therewith a rotary contact device which contacts at predetermined times simultaneously with the primary and secondary terminals respectively of certain of these transformers, by which operation these particular transformers cease to remain active members of the series in which they were located previous to the contact, their coils, however, remaining in metallic contact with the circuit at such times.

1,577,736. SHORT CIRCUITER; E. P. Larsh, Dayton, Ohio. App. filed Feb. 15, 1924. For repulsion induction motors.

1,577,747. AIR-COOLED GENERATING UNIT FOR LOW-FREQUENCY APPARATUS; H. B. Hartman, Scottdale, Pa. App. filed Oct. 29, 1924. Ozone generator.

1,577,749. COMMUTATOR BRUSH MOUNTING; J. McDonald, Dayton, Ohio. App. filed March 14, 1924.

1,577,874. THERMO-ELECTRIC UNIT; S. Ruben, New York, N. Y. App. filed Dec. 1, 1922. Composed of an electrically conductive crystalline compound as galena in molecular contact with two opposing electrodes, so arranged with respect to the compound that the contact area between one electrode and the compound is greater than the contact area between the compound and the other electrode.

1,577,976. POWER-DRIVEN TOOL-OPERATING DEVICE; J. S. Knowlson, Oak Park, Ill., and R. S. McKeage, Chicago, Ill. App. filed April 24, 1922.

1,577,981. RESISTANCE ELEMENT; W. Otto, Neumuhlen, near Kiel, Germany. App. filed Feb. 14, 1924. Composed of at least partially vulcanized rubber and finely divided graphite embedded therein, the material having the physical properties of rubber.

1,577,999. ELEVATOR BRAKING SYSTEM; W. S. Atkinson, Ashland, N. J. App. filed Oct. 7, 1924. To decrease the rate of change of speed.

1,578,018. ELECTRIC CIRCUIT BREAKER; C. Eleman, Chicago, Ill. App. filed April 28, 1923. Renewable fuse.

1,578,033. ELECTRIC SOCKET; J. Hohl, Newark, N. J. App. filed March 27, 1923. Separable socket.

1,578,096, 1,578,097. DYNAMO-ELECTRIC MACHINE; H. K. Sandell, Chicago, Ill. Apps. filed Aug. 22, 1923, and June 10, 1925. A combination of motive power and a generated current, the voltage of the generated current being preferably different from that of the impressed electromotive force.

(Issued March 30, 1926)

1,578,265. CONNECTING CONSTRUCTION FOR BATTERIES AND THE LIKE; T. S. Cole, New Haven, Conn. App. filed Jan. 14, 1922. For storage-battery terminal.

1,578,287. ELECTRODE FOR JET WAVE COMMUTATORS AND INTERRUPTERS; J. F. Hartmann, Copenhagen, Denmark. App. filed May 19, 1925.

1,578,326. RESISTOR; W. J. Larson, West Hartford, Conn. App. filed March 7, 1925. For use as heating elements in load boxes. Made by forming the active member of a section of woven fabric which consists of a warp of non-inflammable and electrical insulating yarn and a weft of electrical resistance wire and binding this member at its ends with metal strips that are utilized as the electrical terminals and are clamped between cross strips of insulating material to the ends of which supporting strips are secured.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

A Debt to the Farmer

IN THE history of mankind nations of people have been classified in accordance with certain of their respective outstanding economic pursuits. Some nations have been essentially commercial, others agricultural and still others seafaring and trading. These pursuits have set up certain social and economic standards of living which have constituted a bulwark of national strength, thus acting as a preventive against any change in the industrial life of the people from generation to generation. England has been the personification of commercialism for hundreds of years, and the peasant has always been the backbone of French national life.

In the economic life of the United States, however, is to be found an exception to this long-established rule. At the foundation of the republic the nation was strictly agricultural, the imports of manufactured products greatly exceeding the export of such products. Since that time the trend has been continually away from agricultural pursuits and toward manufacturing, mining and other non-agricultural occupations. In 1850 only 63.2 per cent of the gainfully employed were to be found on the farms, and these farms contributed but 34.6 per cent of the national income. By 1920 the gainfully employed on farms had dwindled to 26.3 per cent and only 13.8 per cent of the nation's income was contributed by these agriculturists. It was not until subsequent to 1910, however, that the manufacturing establishments of the nation reported a higher percentage of the nation's workers than were employed on the farms.

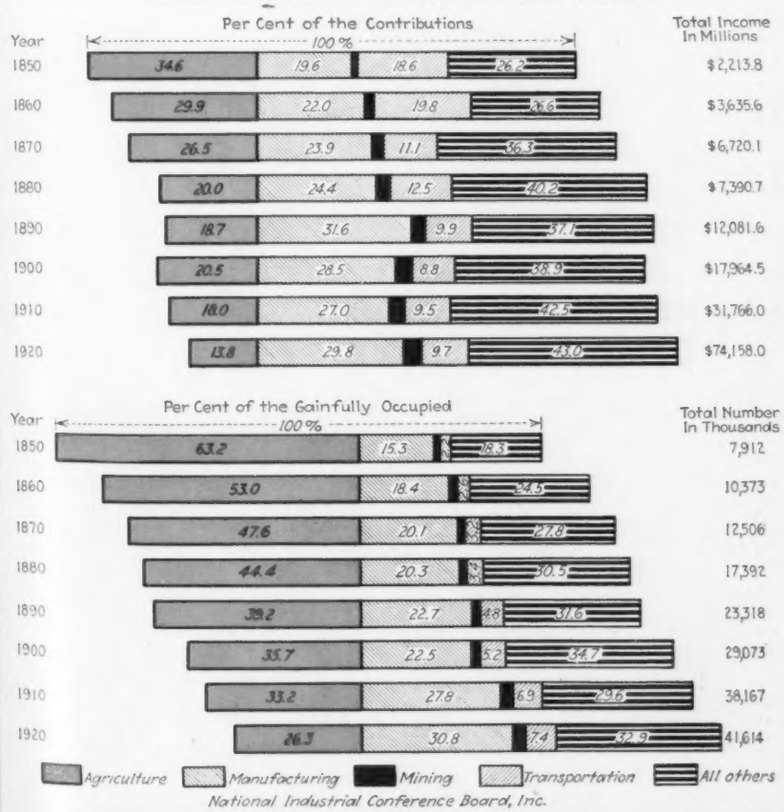
WHILE this trend away from the farm has been of questionable value to the economic life of the nation, there is no doubt of its large value to the electric light and power industry. The gradual concentration in large industrial centers has made it possible for the central station to serve a very much higher proportion of the nation's population than if conditions today were as in 1850, or even as in 1882, when the industry first started its operations. Had it been necessary for the industry to build long distribution lines to reach some four or five million of its present customers, instead of having these customers confined within metropolitan areas, the growth of the industry during the past few years would undoubtedly have been materially retarded.

On the other hand, this very situation presents a task worthy of the most careful consideration of the electric light and power industry. As a public servant the activities of which are dependent upon the economic soundness of the nation, the industry must promote in every way possible those basic elements which go to make up the general economic structure of the republic. It is not economically sound for the agricultural development of the country to lag behind the industrial, commercial and financial branches of our national life. The American farmer is the most efficient in the world, cultivating 47 per cent more land per worker than does the farmer of any other nation, and he uses the most efficient of agricultural implements. But he still lags behind in the general economic development of the country.

Is it not possible that the central station holds the panacea which will place the American farmer upon his feet and bring farm life once more into its own? At the present time less than 3 per cent of the six and one-half million farms are served from private or central-station plants. Picture American industrial, commercial and financial life today under the elevating influence of electric service for light and power, and then picture the American farm electrified to a similar extent. Such a condition would place the farmer on the same economic plane with the worker in urban areas.

The electric light and power industry as a public servant owes a debt to the farmer in the provision of electric service, and in the payment of this debt the industry will reap its just reward through a strengthening of the nation's general economic structure.

How the Major Economic Groups Contribute to the National Income of the United States



Industrial Activity in New England

THE ELECTRICAL WORLD presents herewith a new service for its readers in New England in the form of a barometer of activity in the various industries of that section. This barometer is based upon the energy consumption of about 200 large central-station power customers distributed throughout the section and in various industries. These monthly consumption data for each industry have been adjusted for seasonal variation and compared with the average monthly consumption during the 36-month period 1923-1925. The monthly activity in each industry has been weighted in accordance with the importance of that industry to obtain the general industrial activity of the section. A barometer for the country as a whole will be found elsewhere in this issue of the ELECTRICAL WORLD, and similar barometers will be issued for each section of the nation. These barometers may be obtained as soon as available upon application to the ELECTRICAL WORLD.

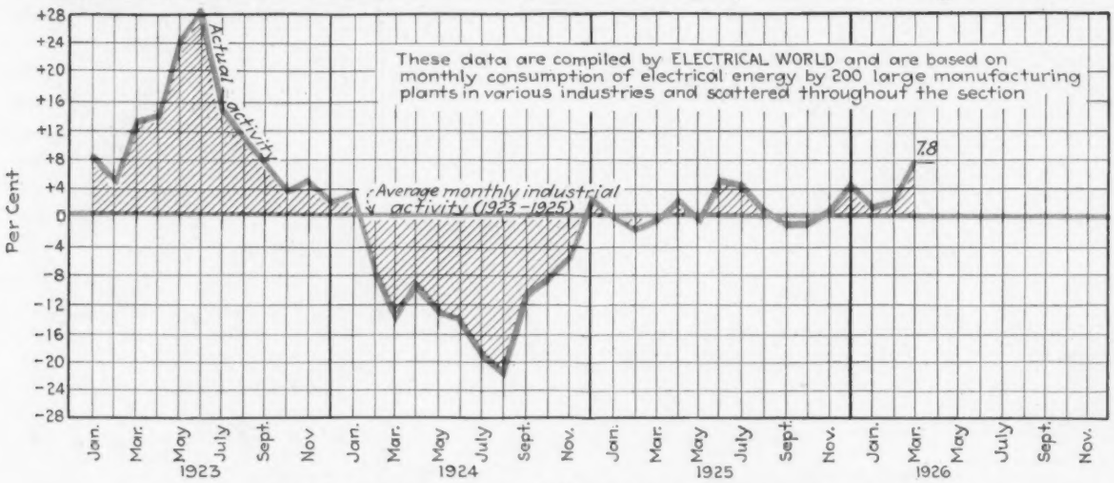
The opening of 1926 found general industry in New England operating at 0.8 per cent above the average monthly rate for the past three years. February activity showed a little improvement, increasing to 2.1 per cent above the average monthly rate, but the month of March found the industry of New England operating at the materially increased rate of 7.8 per cent above the average monthly for the past three years. It is true that this is somewhat below the activity recorded by general industry in the counrty as a whole (13.6 per cent), but it is indicative, nevertheless, of a healthy and prosperous condition in most of New England's primary industries.

Of the six most important industries in the New England States, only one, the leather industry, was operating during March below the average monthly rate for the past three years.

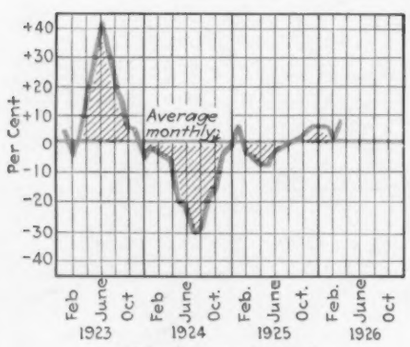
The textile industry—the backbone of New England's industrial life—reported an activity during March of 9.0 per cent above the average monthly. This appears to have been the first time this industry has been operating above the average monthly since the opening of the year. The metal industries, the second in importance in the section, also reported increased operations at 6.7 per cent above the average monthly. These industries, however, have been operating above the average monthly since September of last year.

After an abnormal activity during February, the leather industry again reported a March activity of 6.1 per cent below the average monthly. The rubber and chemical industries reported slightly increased operations during March, but the paper industry reported a slight drop in activities during the month.

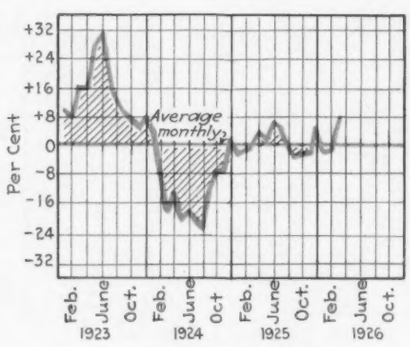
"Electrical World" Barometer of Industrial Activity in the New England States


These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 200 large manufacturing plants in various industries and scattered throughout the section
Actual activity
Average monthly industrial activity (1923-1925)
7.8
Per Cent
+28 +24 +20 +16 +12 +8 +4 0 -4 -8 -12 -16 -20 -24 -28
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov.
1923 1924 1925 1926

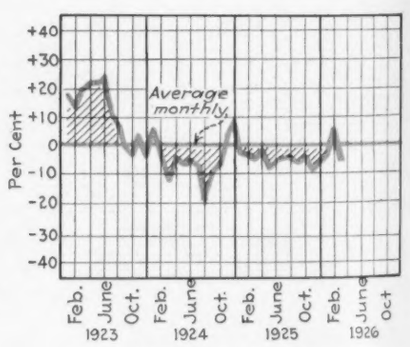
General Industrial Activity in the New England States



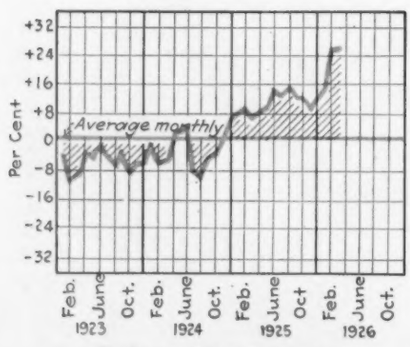
Metal Industries



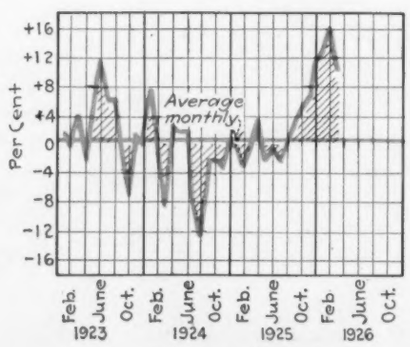
Textiles Industry



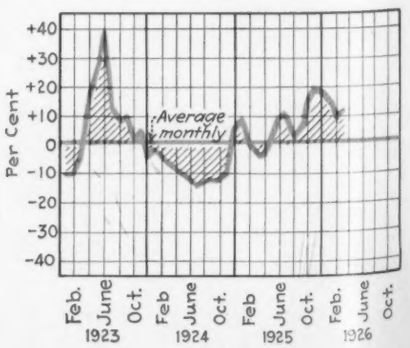
Leather Industry



Chemicals Industry



Paper Industry



Rubber